

Rapa Nui Landscapes of Construction Project (LOC 10)

A Survey of Eye Petroglyphs at Rano Raraku



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Rapa Nui Landscapes of Construction

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On the Island, LOC works with Rapanui elders and students and in close cooperation with the *Corporacion Nacional Forestal* (CONAF), Rapa Nui, and the *Museo Antropológico P. Sebastián Englert* (MAPSE).

The main aim of the project is to investigate the construction activities associated with the Island's famous prehistoric statues and architecture as an integrated whole. These construction activities, which include quarrying, moving and setting up of the statues are considered in terms of Island-wide resources, social organisation and ideology.

The Project is not just concerned with reconstructing the past of the island, but is also contributing to the 'living archaeology' of the present-day community, for whom it is an integral part of their identity and their understanding and use of the island. LOC is working with the Rapanui community to provide training and help in recording, investigating and conserving their remarkable archaeological past. Fieldwork between 2008 and 2013 was undertaken under a permit issued by the *Consejo de Monumentos Nacionales*, Chile (ORN No 1699 CARTA 720 DEL 31 del 01.2008).

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A Survey of Eye Petroglyphs at Rano Raraku

by Sue Hamilton, Mike Seager Thomas & Ruth Whitehouse

1. Introduction

The present survey was prompted by the discovery during excavations at Puna Pau quarry of a pair of petroglyphic eyes on the quarry wall (LOC 2012, 8–9; Hamilton 2013, 101). What was the meaning of these? And how did they relate to the quarry in which they were found? Individual and pairs of eyes are common in Rapanui rock art, both sculptural and petroglyphic, but they usually occur as a small part of a larger overall design — a *moai* mounted on an *ahu*, the Make Make eye mask or the birdman motif. Disembodied eyes, such as those found at Puna Pau, are not widely recognized. Georgia Lee, for example, reported only 14 pairs around the Island (Lee 1992, 31). A concentration of disembodied eyes however has been noted (though not previously reported on) at Rano Raraku, the stone from which — almost alone amongst those used on the Island — shared Puna Pau's restricted use and widespread distribution. In a study of the nature and meaning of the disembodied eye motif in Rapanui quarrying, therefore, Rano Raraku is a good place to start.

The aim of the survey was two-fold. In addition to seeking an understanding of the nature and meaning of the eye petroglyph in quarrying, we were asked by *CONAF* to produce a report that would assist it, and its rangers, to identify currently unknown eyes, to locate the eyes identified during our survey and conduct conservation monitoring of these. Central to both was a detailed study of petroglyph morphology, condition and context within the quarry.

The survey was conducted over two seasons (approximately 10 whole days). A pilot survey was carried out at the end of January/ the beginning of February 2013, under the guidance and with the assistance of *CONAF* ranger Cristopher Ahsoun Tuki. This enabled us to develop a coherent fieldwork methodology appropriate to the site and our survey aims. Its results were reported to *CONAF* in summary form with our fieldwork proposals for 2014/15 (LOC 2013, 7 & appendix 2). A second, more detailed survey was carried out in January 2014, guided by and with the assistance of *CONAF* ranger Julio Haoa Avaka. Together we identified and recorded nine pairs, 17 single and four single/ possible pairs of eyes, along with a handful of petroglyphs of other types. Here the 30 eye petroglyphs are reported on in detail for the first time (*Appendix 1; Digital appendix 1*). The other petroglyphs identified are summarized in Appendices 2–5.

2. Interpretative Context

The eye motif is a widespread cultural meme, which as human beings we automatically recognize and react to. A recent article on the ethology of eyes, amongst which are included Rapa Nui's eye masks, argues that they 'reflect the evolution of the brain in its expressions of fear, love and behavior' (Watson 2011, 87). We know too that in Polynesia, stone, like other natural things, could be seen as representational of, and/ or a receptacle of spirits and spiritual power and that its quarrying therefore was sometimes symbolically and ritually constrained (Linton 1923).

The existence of eyes carved on the walls of the quarry that produced *moai* (Rano Raraku) and on the walls of the quarry that produced *pukao* for the *moai* (Puna Pau) suggests a link between stone representations of the ancestors and the idea that the ancestors were extracted from ‘living’ rock. It has long been observed that the *moai* at Rano Raraku and on the routes to the *ahu* are blind/ eyeless, and that only *moai* at *ahu* were given eye sockets. At *ahu*, the eye sockets received further attention to render them ‘seeing’. Irises of coral with red scoria or obsidian pupils were inserted into the eye sockets (Martinsson-Wallin 2007, 45–47). Most of the eyes that we identified carved on Rano Raraku’s quarry walls have the same lenticular slanting or teardrop shape as the eye sockets and eye insets of the *moai* at *ahu*, and some are of similar dimensions. These similarities suggest that the carvings of eyes in the quarry are likewise ‘seeing’ eyes. The majority of *ahu* with *moai* are located around the coastline and their *moai* faced landward. It is commonly suggested that the *moai* laid claim to the land that they overlooked, and that they oversaw people and places that the monumental gaze of the *moai* could be seen from (Simpson 2009). Similar concepts may govern the act of carving and the choice of location of the quarry eyes. These governing concepts could include the stage in quarrying when eyes were carved on the quarry walls, what they were positioned to oversee, and from where they may have been seen. Whatever their precise conceptual meaning, a topic that we intend to explore fully in our final synthesis of the Rapa Nui eye data, the eyes on the quarry walls of Rano Raraku and Puna Pau would have been influential to the people who experienced their gaze and they would have bestowed meanings on the locales where they were carved.

3. Method

The 2014 survey is best characterized as a ‘guided walkover survey’. We said where we wanted to go and our guide led us there by the safest and most respectful route. In order to see as many eyes as possible and to identify both those locations where eyes did and where eyes *did not* occur, we aimed to enter and survey every quarry bay on the mountain, and to look at every *unquarried* surface. In the end time precluded this, and our survey was restricted to the quarry’s exterior and interior slopes, where we entered all but a handful of bays, entrance to which was either unsafe or over *moai* (and therefore prohibited). Allowing for vegetation, which wholly or partly obscured some bays’ walls, we estimate that we surveyed between 70% and 80% of these two parts of the quarry and have seen and recorded all the eyes currently visible to the trained, but unaided eye.

The survey was conducted out of park hours in order not to provoke trespass by tourists into areas of the quarry that are currently out of bounds.

Recording consisted of a written and a detailed photographic record of each eye or pair of eyes and selected whole bays. Each petroglyph was assigned a unique feature number. The feature number of eyes identified on the quarry’s exterior slopes was prefaced with ‘E’; that of eyes identified on its interior slopes with ‘I’. The feature number of other petroglyphs, both on its exterior and interior slopes was prefaced with ‘A’. Each eye or pair of eyes

1. Working number		2. Grid ref
3. Location (<i>sketch</i>)	Outside/ inside crater	<ul style="list-style-type: none"> • quarried rock face • unquarried rock face • quarry bay (rear wall, left wall, right wall etc.) • between quarry bays • height on wall • other
4. Type (<i>sketch with dimensions</i>)	single/ pair	<ul style="list-style-type: none"> • lenticular • direction of slant (if any) • circular • oval • other
5. Execution		<ul style="list-style-type: none"> • incised • in negative relief • in positive relief • incised and in positive relief (<i>detail</i>)
6. Condition/ definition	clear/ faint	<ul style="list-style-type: none"> • truncated/ damaged by later quarrying • water worn • matrix removal • silica reprecipitation (thickness/flaking/percentage) • lichen (type/colour/percentage) • insect comb • other
7. Associated <i>moai</i>	yes/ no	<ul style="list-style-type: none"> • attached • detached (supine or standing) • features indicative of <i>moai</i> removal
8. Associated tool marks	yes/ no/ unknown	<ul style="list-style-type: none"> • tool marks cut eyes • tool marks cut by eyes • tool marks avoid/ respect eyes • eyes avoid/ respect tool marks; etc.
9. Associated petroglyphs	yes/ no/ unknown	<ul style="list-style-type: none"> • other eyes • other petroglyphs <i>Detail both and note physical relationships as above</i>
10. Local outlook		<ul style="list-style-type: none"> • wall of quarry bay • entrance to/ mouth of quarry bay • <i>moai</i> in quarry bay • other petroglyphs <i>Cross reference with 7 & 9</i> <ul style="list-style-type: none"> • <i>moai</i> outside quarry bay
11. Regional outlook	yes/ no	<i>Describe</i>
12. Other Comments		
13. Photos	yes/ no	<i>Give first photo number</i>
14. 3-D recording	yes/ no	

Figure 1.
Eye recording prompt sheet

was georeferenced using a Brunton *Multinavigator* or Garmin *Etrex* GPS and plotted in the field onto the University of Chile's 1986 map of the exterior quarries, and *GoogleEarth* satellite photos (re-scaled to 1:5000) of the

exterior and interior quarries. The written record was later transferred to an *Excel* worksheet (*Digital appendix 1*) that can be questioned in order to identify any interpretatively useful trends of association or outlook and isolate patterns of vulnerability and deterioration useful to *CONAF* in the development of a strategy for their future conservation. The photographic record (*Digital appendix 2*) is currently being used (by Adam Stanford of *Aerial-Cam*) to create 3-D models with *Agisoft PhotoScan* (professional edition), which can be manipulated to bring out features invisible to the unaided eye (e.g. pair of eyes E07).

The written record

To ensure consistent recording, the taking of the written record was led by a pre-prepared prompt sheet (*Figure 1; Digital appendix 3*). The prompts covered four areas — the location of the eye or eyes in the quarry (prompts 2 and 3), their morphology (prompts 4 and 5) and condition (prompt 6), their immediate associations (prompts 7–9), and their wider context (prompt 10–12).

Location. Using the UTM WGS84 grid system, thirteen figure grid references were obtained for — or close to — each eye or pair of eyes. *From the perspective of a recorder outside the quarry bay looking in*, we noted where in each quarry bay they occurred (on the left wall, the right wall, on the rear wall) and at what height in relation to the modern landsurface (below body height (low), within reach of a standing person (middle) or out of reach of a standing person (high)) (*Figure 2*).



Figure 2.

The position of the eye petroglyphs identified was recorded horizontally (left) and vertically (right). Vertical position was recorded as low (bajo), middle (media) or high (alto)



Figure 3.

Eye petroglyph morphology: (1) a single left lenticular eye downturned to the left; (2) pair of lenticular eyes; (3) oval eye; (4) a pair of rounded eyes (Puna Pau); (5) single left lenticular eye with an upturned 'flick'; (6) pair of lenticular eyes (upturned); (7) pair of downturned lenticular eyes; and (8) single right lenticular eye
Various scales

Eye morphology. The number of eyes comprising each petroglyph, the shape of these (lenticular, oval, round or other) and when lenticular, if they slant down or not, was recorded, as was the presence or absence of a 'flick', an up or downturned line beyond the eye proper (*Figure 3*). Execution was recorded as incised, in relief, or the (apparent) merging of the two (*Figure 4*). Where eyes were within our reach, the width and height of each eye was measured

(slanted eyes were measured horizontally and vertically and along the long and short axes of each eye), as were the gaps between them, the lengths of any flicks, and when incised, the width of the carved lines. For those that were out of reach these measurements were estimated, and the fact that the measurements were estimates noted. In all instances the record was made from the point of view of the recorder looking at the eye or eyes, and the terms 'left' and 'right' used in this sense.



Figure 4.
Execution: (top) incised eye; and (bottom) eye in positive relief
Scale 10 cm



Figure 5.

Weathering: (1) almost unweathered worked tuff; (2) weathering gradient across eye (almost unweathered to the top left of the picture; slight to moderate matrix removal to the bottom right); (3) matrix removal across the lower part of eye; (4) matrix removal from, and silica reprecipitation (the white deposit) on and eye; (5) laminating tuff; and (6) lichen growth

Scale 10 cm

Eye condition. No eyes had suffered physical damage but all had been subject to varying degrees of chemical weathering. This was assessed as 'light', 'moderate' or 'heavy' and in terms of matrix removal (the weathering-out by solution of the fine sediments filling the interstices between the Rano Raraku tuff's larger lapilli and inclusions), and the chemical re-precipitation *and flaking* of a soluble white mineral (silica and/ or zeolite) on the surface of the rock. Matrix removal was assessed as 'slight', 'moderate' or 'severe'; and chemical re-precipitation in terms of the thickness of the encrustation and the area of the eye affected. In one case (eye E19), matrix removal was so severe between the beds comprising the rock that it was causing the surface of the eye to laminate (*Figure 5*). This was recorded separately. We also assessed how much of each eye or pair of eyes was covered in lichen. Also widely observed was the development of a dark weathering rind or patina (cf. Charola 1997, 24). This was *not* recorded but its presence or absence is clearly visible in the 2-D photographs taken.

Artefactual associations. These include *moai* immediately in front of, behind/ above or to the side of the eye or eyes, tool marks and other, immediately associated petroglyphs or carving. Also of interest are quarry features indicative of *moai* removal (*Figures 6 & 7*). We were interested in both the presence and absence of these features and their most likely sequence in relation to the carving of the eyes, where their position or cutting rendered this discernible.

Wider context. This refers to the visibility of the rest of the quarry and the landscape beyond it from the eyes and the visibility of the eyes and the bays in which these occur from outside. Because the potential variability of this, it is addressed in our field notes under Comments (prompt 12).

Photographic record

2-D photographs were taken of each eye or pair of eyes, of any features immediately associated with it, of the bay where it is located (*Digital appendix 2*) and of the outlook from it. 3-D models are being made of each eye or pair of eyes and of five whole bays (*Figure 8*).

Methodological issues

Most of the problems encountered during the survey related to access, visibility and mapping. Not every bay and not every visible eye could be reached by the team, either because access to them was unsafe (for the team or site) or over *moai*. Binoculars and pole mounted cameras allowed us to see some eyes that were physically inaccessible (e.g. eyes E13 and E14), but we could not record them fully, and there were locations where we could not see into a bay or a part of a bay at all and could neither rule in nor rule out the presence of an eye or an associated feature. Parts of other bays were hidden by vegetation (a Make Make face recorded in 2013 — A07 — was completely overgrown in 2014 and could not be re-located) or difficult to see because of the variable light available at the time the survey was conducted. At a local



Figure 6.
Evidence of moai removal (1). Remnant rounded (white arrow) and angular 'keels' (red arrow). Both bays are grooved along the edge, that to the right displaying a prominent flange where the extracted moai was undercut (cf. Figure 7) (yellow arrow). The undercut of the bay on the right is also characteristic



Figure 7.
Evidence of moai removal (2). Longitudinally groove with a prominent flange similar to that shown to the left of Figure 6 (yellow arrow) above in an situ moai, indicative of the removal of a moai from above the existing one (left); remnant angular 'keel' (right)

scale, trampling down the vegetation and the 3-dimensional modelling of surfaces helped. The record made during the pilot survey, which was carried out at a different time of day, also filled in some gaps. But again there are places where we are unable either to rule in or rule out the presence of an eye, or an associated feature. Finally, mapping the eyes was made difficult by the depth of the bays on the quarry's steep, south-facing exterior slopes, which prevented us from obtaining accurate GPS readings. The solution to this latter problem was found on *Google Earth*. Poorly georeferenced eyes were plotted onto its satellite coverage of the site and their latitudes and longitudes obtained using the 'What's here' function. These latter were converted to UTM grid references using the GPS coordinate converter at <http://boulter.com/gps/>.

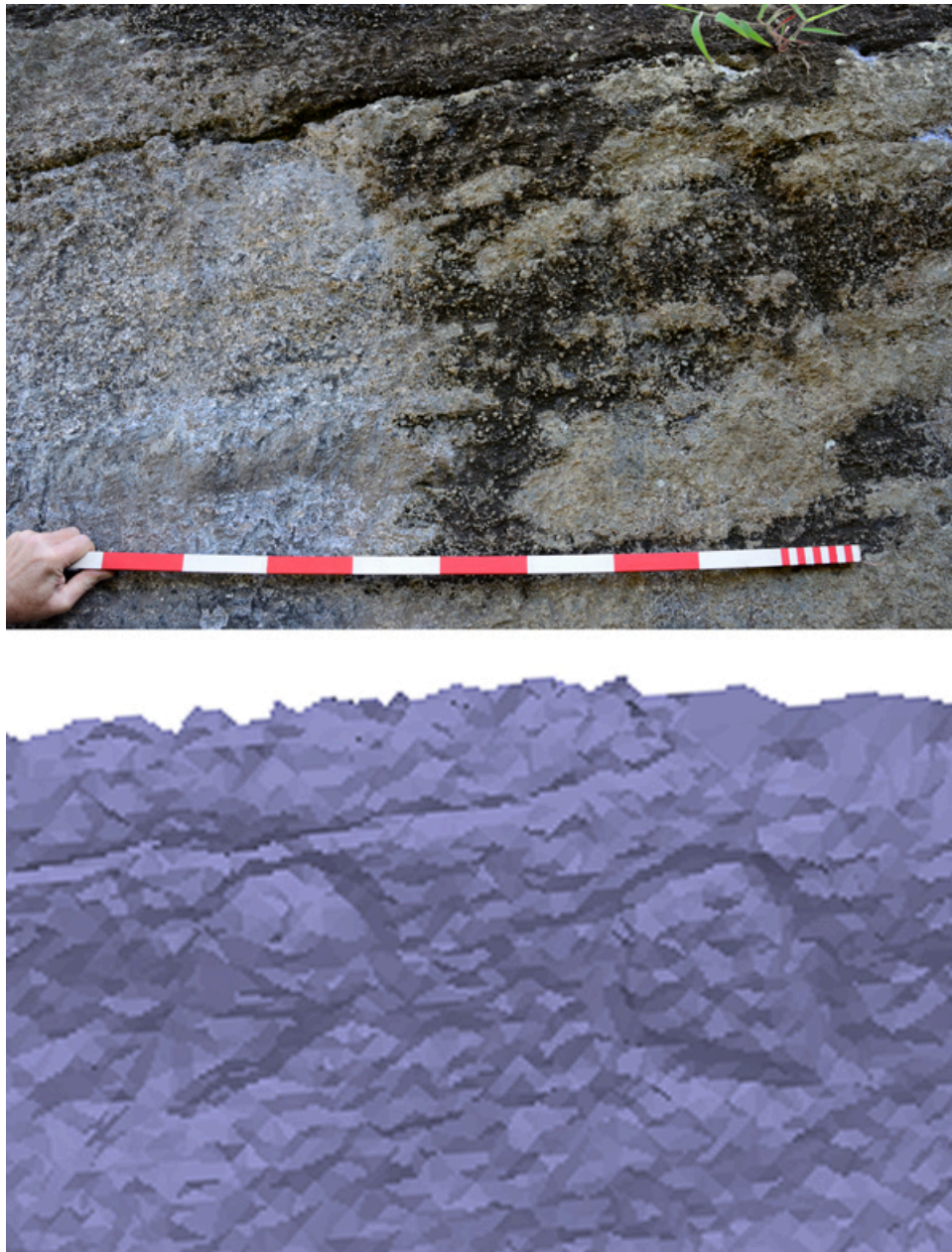


Figure 8.
*Eye petroglyph E07 photographed 2-dimensionally (left) and 3-dimensionally (right).
Scale 1 m*

4. Results

The main information recorded is summarized in *Appendix 1* and *Digital appendix 1*. The salient points are discussed in the following sections.

Exterior quarry

Eyes were recorded in 21 locations on the quarry's exterior slopes (*Figure 9*). Of these, six were definite pairs, four possible pairs and the other 11 single. In terms of location, 12, including four pairs and two possible pairs, occur on the rear of a quarry bay, another eight on the sides of bays (three, including one pair and one possible pair, on the right sides, five, including one pair and one possible pair, on the left sides), while one is situated between two quarry bays. Two are in 'low' locations within the bay (i.e. one has to bend to view them), 11 are at 'middle' heights (i.e. they are within reach of a standing person), while five are in 'high' locations (i.e. they are out of reach). The bay in which E13, E14 and E21 is inaccessible and it is difficult to assess their heights.

The eyes comprising five pairs, three possible pairs and eight single eyes are lenticular in shape, two are oval and two sub-round. The remaining pair consists of round (possible) eyes, analogous to those discovered at Puna Pau (E06). Most of the single lenticular eyes can be identified as either 'left' or 'right' on the basis of their shape and slant. However, the sub-round and oval eyes cannot be distinguished as easily in this way. The lenticular, sub-round and oval eyes measure between 20 and 51 cm in width and 13 and 35 cm in height. The round eyes — the smallest identified on site — have a diameter of 7 cm. In the pairs, the gap between the eyes ranges from 13 to 30 cm. 16 eyes or pairs of eyes are incised, the pair of round eyes is in negative relief (i.e. excised), one eye is executed in relief and two pairs of eyes show a progression from incision to relief.

All the eyes have been affected by weathering. This takes the form of matrix removal, varying in extent from slight to severe, as well as chemical re-precipitation and lichen growth. One eye located on a pronounced ledge is laminating and cannot be expected to survive for long (E19).

In fourteen locations with eye petroglyphs, one or more *moai* had definitely been removed from the quarry bay, while in a further five places *moai* removal had probably occurred and in one the situation was unclear. In ten cases there was a *moai* still *in situ* in the bay, although there was also evidence of certain or probable removal of one or more *moai* from the same bays. No bay that contained a *moai* but from which no *moai* had been definitely removed had an eye petroglyph; nor have we spotted them on unquarried surfaces.

For the most part the eyes identified on the quarry's exterior slopes fall into four discrete, widely separated groups (see *Figure 9*). Eye E01 and pair of eyes E02 are in one bay; E04 is at the mouth of the bay in which E05 is located; and E06–E17 and E21 are in contiguous bays, as are E18 and E19 (E14 and E13 or E21 possibly comprise a widely space pair). Only E03 and E20, at opposite ends of the distribution, occur in isolation, and it is perhaps significant that neither of them is lenticular in shape. Single eyes E09–E11, which comprise a vertical sequence should perhaps be explained in terms of a sequence of *moai* removals. Eyes E01 and E06–E08 are associated with petroglyphs of other types.

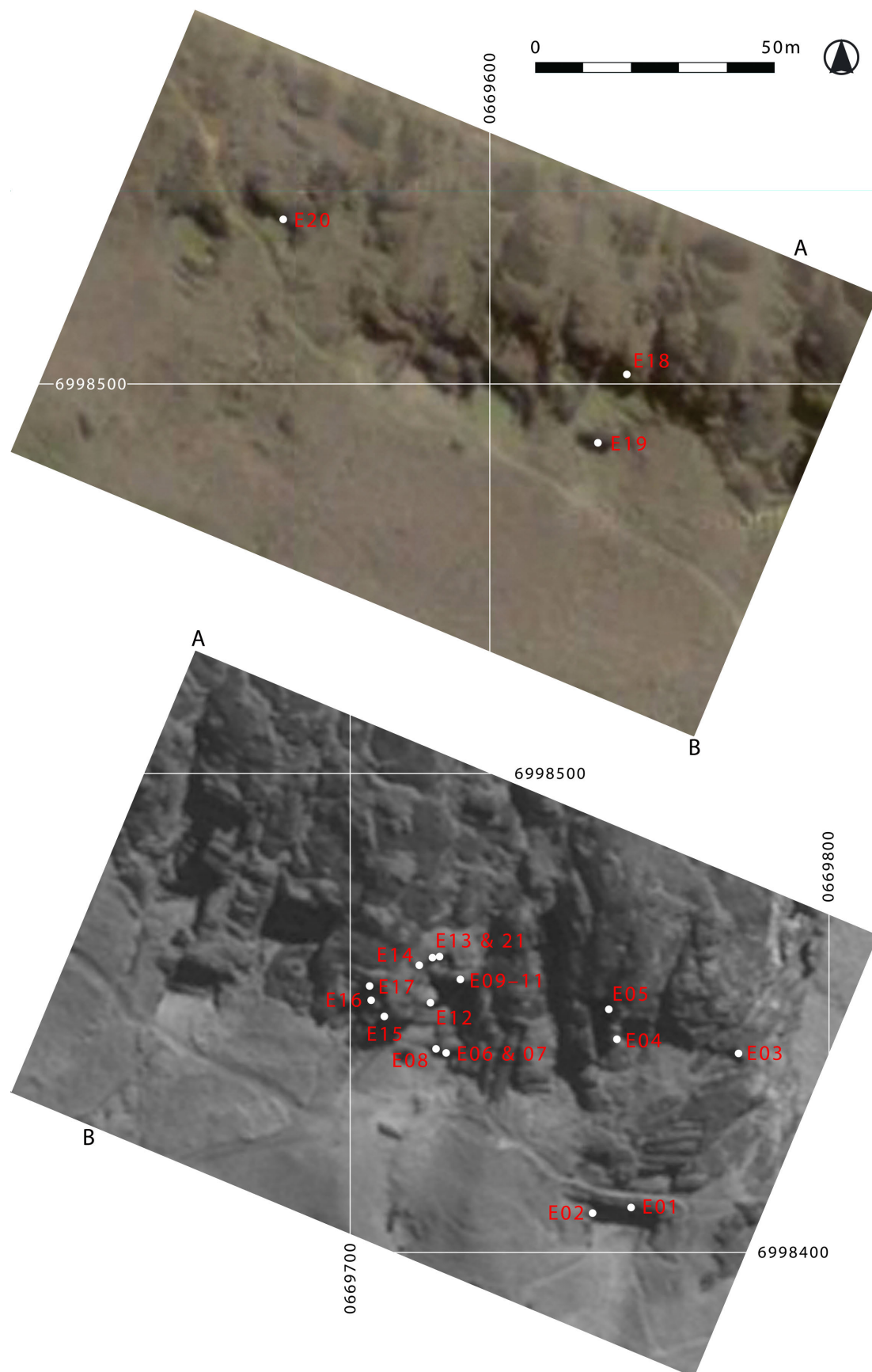


Figure 9.
*Eyes recorded in the exterior quarry (colour photo Google Earth © 2014 DigitalGlobe;
 black and white photo © 2004 IGM Chile)*

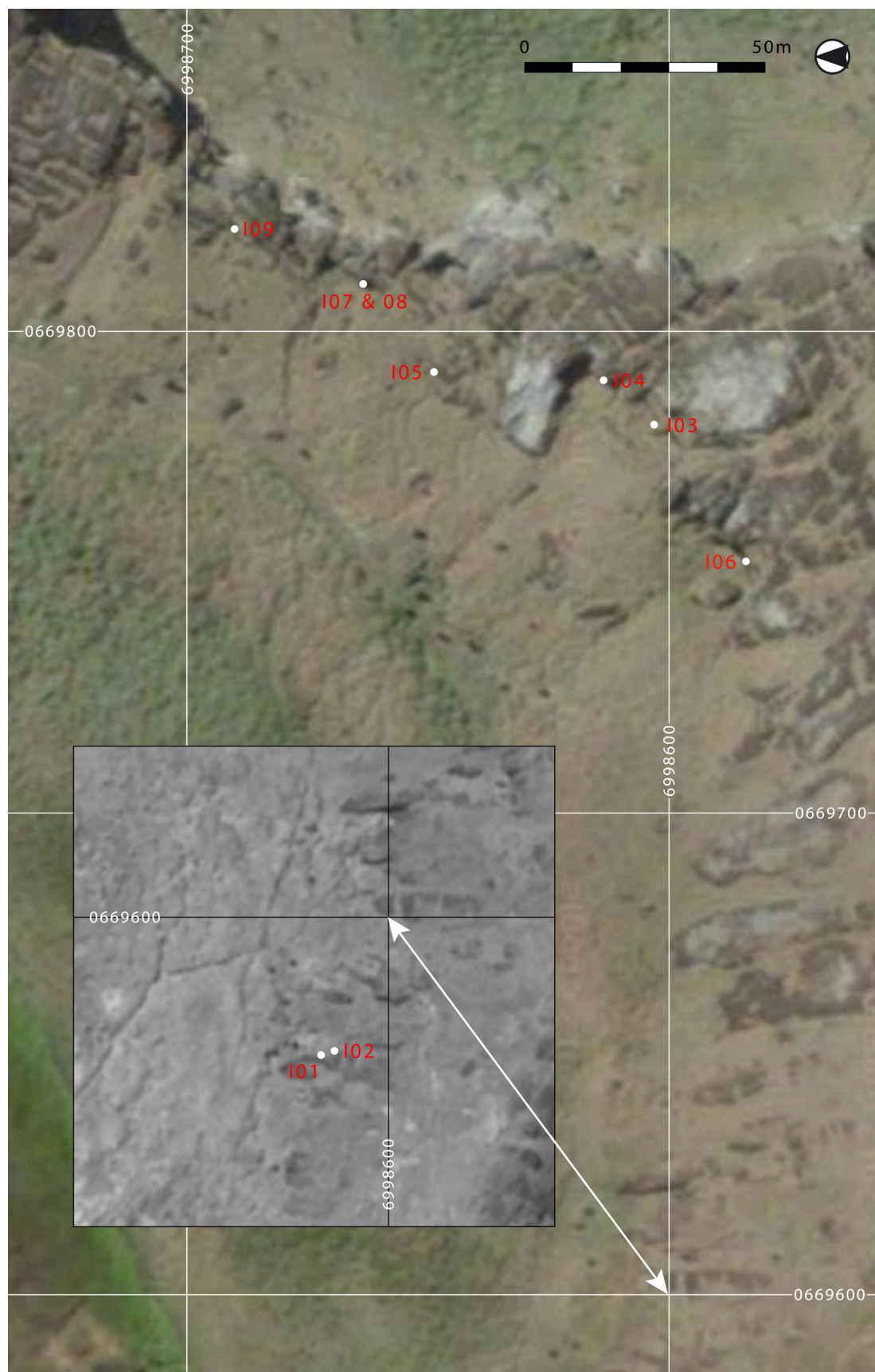


Figure 10.
*Eyes recorded in the interior quarry (colour photo Google Earth © 2014 DigitalGlobe;
 black and white photo © 2004 IGM Chile)*

Interior quarry

Eyes were recorded in nine locations in the interior of the quarry (*Figure 10*). Of these, three were pairs, the other five single. In terms of location, six, including the three pairs, occur on the rear of a quarry bay, the other three on the sides of bays (two on right sides, one on a left side). Four are in low locations within the bay (i.e. one has to bend to view them), and four are at 'middle' heights (i.e. they are within reach of a standing person). One possible eye (I06) is just out of reach.

All the eyes are lenticular in shape and, because of their shape and slant, it is possible to identify all but one of the single eyes as either 'left' or 'right' with confidence. They generally measure between 23 and 35 cm in width, 13 to 29 cm in height; one very large single eye (I03) is 69 cm wide, 32 cm high. In the pairs, the gap between the eyes ranges from 8 to 17 cm. In one case (I07) a pronounced 'nose' is visible between the eyes; this is the upper part of one of a series of double hooks, which run horizontally across the bay (*Figure 11*). The unusually small gap between these eyes perhaps indicates that the association was deliberate (i.e. the nose is earlier). The eyes are all incised except for one pair (no. I04), which shows a progression from incision to relief, and the single eye (I06), which is in negative relief.

As in the exterior quarry, all the eyes are affected by weathering, which takes the form of matrix removal, varying in extent from slight to severe, as well as chemical re-precipitation and some lichen growth.

In seven out of the eight locations, one or more *moai* had definitely been removed from the quarry bay, while in the eighth case the situation is unclear. In five cases there was a *moai* still *in situ* in the bay, but there was also evidence of previous removal of one or more *moai* from the same bay.

The clustering of eyes in the interior quarry is less pronounced than it is in the outer, but eyes I01 and I02 form a widely spaced pair of a left and a right eye similar to the exterior quarry's E14 and E14 or E21, and I07 and I08 are in the same bay. Two pairs of eyes (I04 and I05) are associated with petroglyphs of other types (*Figure 12*).

Wider context

A further aspect of our investigation relates to *visibility*: both the visibility of the rest of the quarry and the landscape beyond it from the identified eyes and the visibility from the outside of the identified eyes and the quarry bays in which these occur.

In terms of visibility outwards *from* the eyes, the views from the eyes placed on the sides of quarry bays are obviously restricted. Often they extend only to the other side of the bay. Two (E05 and E15) look straight over the faces of *in situ moai* (*Figure 7, left*). By contrast, the eyes located on the backs of bays frequently have extensive views: over the lower slopes of the quarry and the landscape beyond, extending to the sea, in the case of the exterior quarry (*Figure 13*), and over the water-filled crater in the case of the interior quarry. There is no evidence that particular types of outlook were favoured, either for particular configurations of eyes or for eyes generally and it seems unlikely that their positioning had anything to do with a perception of what the eyes themselves might see.

In terms of the visibility of the eyes by an approaching observer, the same distinction emerges. Eyes on the sides of bays can normally only be seen from within the bay itself, whereas those on the backs of bays can be seen from some distance. Establishing exactly what distances are involved is difficult: whereas the rock faces comprising the backs of the quarry bays can



Figure 11.

Eye petroglyph I07 (top) and one of the row of 'rope anchors' upon which it was superimposed or which was superimposed upon it (bottom)

be seen from hundreds of metres away, the carved eyes themselves only become apparent at tens of metres or less, at which distance the lowest of them (e.g. I08) are often hidden by the floors of the quarry bays in which they are located, so that it is necessary to approach even closer to see them. This is because the eyes, particularly in their present weathered condition, merge visually into the background rock face. It is worth noting, however, that many of the eyes are large enough to have been seen from further away

had they been made to stand out from the backing rock in some way, e.g. by the application of colour.



Figure 12. Toki-like or foot motif adjacent to eye petroglyph 105. Scale 50cm

Provisional interpretation

Final interpretation of the meaning of the eye motif and its use at Rano Raraku cannot be attempted without comparing the form and context of the eyes identified at Rano Raraku with that of the eyes known elsewhere on the Island, and without establishing whether it is present or not at other quarries on the Island, and if it is, how it is configured there. We propose doing this shortly (see Recommended Future Work, below). That said a number of facts have emerged from the present survey, which suggest some likely interpretative directions. These facts are:

- Eye petroglyphs of lenticular shape cluster within the quarry.
- Eye petroglyphs of other shapes do not cluster. (The eyes at Puna Pau are rounded).

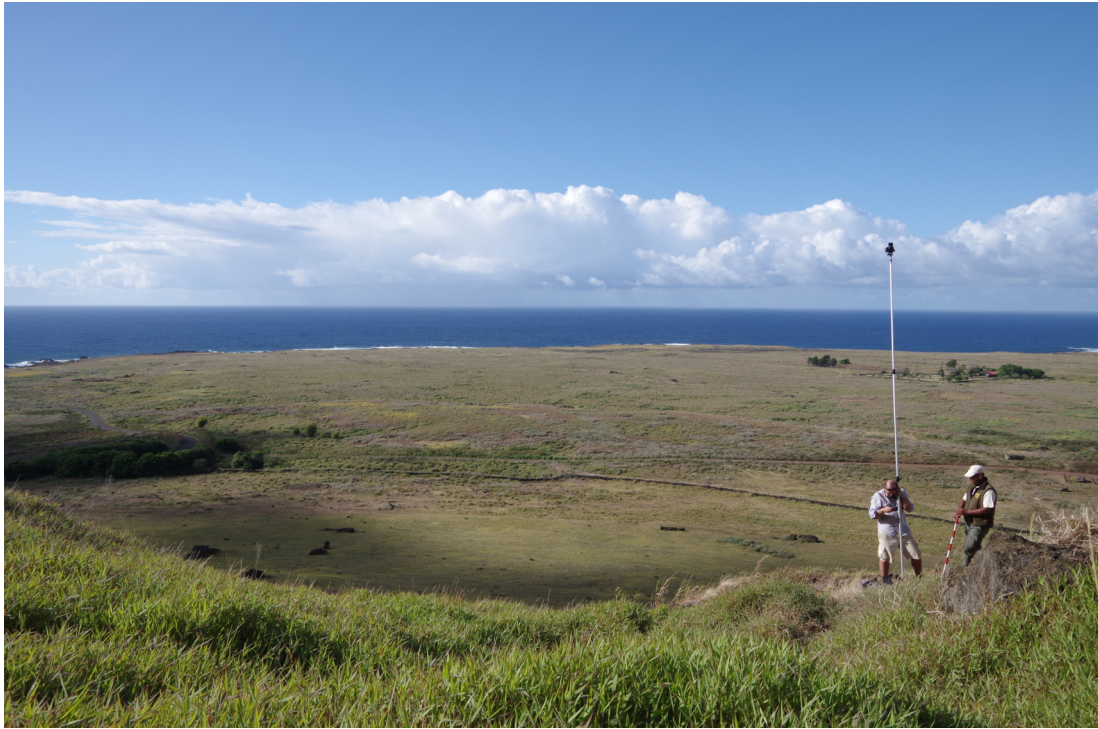


Figure 13.
Outlook from eye petroglyph E19

- All but two of the 30 eye petroglyphs identified were associated with definite or probable *moai* removal, while no bay that contains a *moai* and from which no *moai* have been removed contains an eye petroglyph.
- While eye motifs often consist of pairs of eyes, single eyes outnumber both pairs and possible pairs.
- Eye petroglyphs *generally* do not reference the landscape around them, nor are they easily visible from it.

Individual as opposed to pairs of eyes at Rano Raraku do not stare the viewer down and presumably do not evoke the same behavioral response (cf. Watson 2011, 92). Indeed many appear not look at *us* at all. Despite the eye motif's apparent concentration at Rano Raraku, moreover, they neither reference Rano Raraku as a place, nor the uncommon rock it yielded, but rather the *moai* there and a particular stage in their production. This appears to put their use in the context of sacred industry, in which the process involved in production was as important — if not more important — than the material used (cf. Handy 1927, 286–8; Linton 1923, 164–5; Richards *et al.* 2011). The precise role and meaning of the eye motif in this context, however, remains to be established.

5. Recommended Future Work

For the reasons noted above (section 3), we were not able fully to survey the quarry, nor, in those parts of the quarry that we did survey, were we always able to rule in or rule out the presence of an eye, or an associated feature.

These gaps could be filled by: firstly, surveying those parts of the quarry, particularly the saddle between the quarry's exterior and interior slopes, which we did not enter; secondly, re-surveying the bays surveyed by us under different vegetation and lighting conditions (a different time of day or year); and thirdly, by conducting a more thorough 3-D photographic survey. From the perspective of conservation, the data on eye location generated by the 2013 and 2014 surveys could be used predictively. In order to achieve a representative and interpretatively useful record, however, survey would best be conducted on the quarry as a whole or on a random sample. More detailed mapping of the quarry and of what has and what has *not* been looked at would also be desirable.

Repeat survey would also help isolate eyes that are vulnerable and so allow the design by *CONAF* of an appropriate strategy with which to deal with this, both in terms of protection and access.

Finally, returning to the original interpretative aim of the survey, the elucidation of the nature and meaning of the disembodied eye motif in Rapanui quarrying generally, we recommend continuing the survey elsewhere on the Island. This would take two forms. Firstly, a review of the morphologies and contexts of the 14 pairs of disembodied eyes reported by Georgia Lee (1992, 31), comparing and contrasting these with the eyes identified both at Puna Pau and Rano Raraku. And secondly, a survey of the type conducted at Rano Raraku in another area of known quarrying — perhaps on Terevaka and/ or the area around Rua Toki Toki, where coarsely pre-crystallized flow lavas were quarried for *paenga*.

6. Conclusion

The extent of our survey coverage of Rano Raraku in 2013 and 2014 and the good preservation of most of the eyes found gives us confidence in the reliability and representativeness of the record that we have made and summarized here. We recorded eye petroglyphs already known and we found and recorded new ones and recorded both in a way that will be easily accessible and of practical use to new rangers, conservators and future researchers alike.

For LOC the next obvious steps in this programme of recording would be to survey the saddle between Rano Raraku quarry's exterior and interior slopes and to expand the 3-D recording of eye petroglyphs and their associated quarry bays across the quarry as a whole, and thus provide a more detailed and complete record of their morphology, state of preservation and context. Additionally, to provide a complete context for the interpretation of the Rano Raraku eyes it is important to take the survey beyond Rano Raraku itself and to survey other contexts in which eye petroglyphs are known to, and may occur, such as other quarries and other petroglyph locations in the landscape. Only in this way can we move from the provisional interpretations outlined above to something of real meaning to our understanding of Rapa Nui prehistory.

The eyes at Rano Raraku will inevitably continue to deteriorate. Our survey will assist in *CONAF* in monitoring the rate and nature of this deterioration. There is little that *CONAF* or any one else can do to stop this deterioration, without destroying the integrity of the quarry as a whole (e.g. by moving the eyes away, which we do not suggest). The importance of our work in this respect is that there is now a record of them upon which their

interpretation can be built by LOC, by CONAF Rapa Nui and by future researchers. Prior to our survey there was not.

Summary

- Eyes occur on the backs or sides of quarry bays at heights ranging from low (requiring bending to view) to high (out of reach). One eye is located on a quarried surface between bays.
- No eyes were identified on unquarried surfaces.
- The survey identified 9 pairs of eyes and 21 single eyes, four of which have traces of possible eyes next to them (39 individual eyes).
- Of the nine pairs of eyes, seven were on the backs of quarry bays.
- The most common eye shape is lenticular, but round, sub-round and oval eyes also occur.
- Eyes range from 7 to 69 cm in width and 7 to 35 cm in height.
- The most common method of execution is incision, but positive and negative relief carving also occur.
- All the eyes have been affected by weathering, which takes the form of matrix removal, varying in extent from slight to severe, as well as chemical re-precipitation and lichen growth.
- Most bays with carved eyes had definite or probable evidence for the removal of one or more *moai*.
- Some bays with carved eyes also had *moai* still *in situ*.
- Lenticular eyes cluster in discrete groups within the quarry.
- Eyes located on the backs of bays frequently have extensive views but no particular focus.
- While the quarry bays in which eyes are located are distinguishable from a considerable distance, the eyes within them are not.

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Acknowledgements

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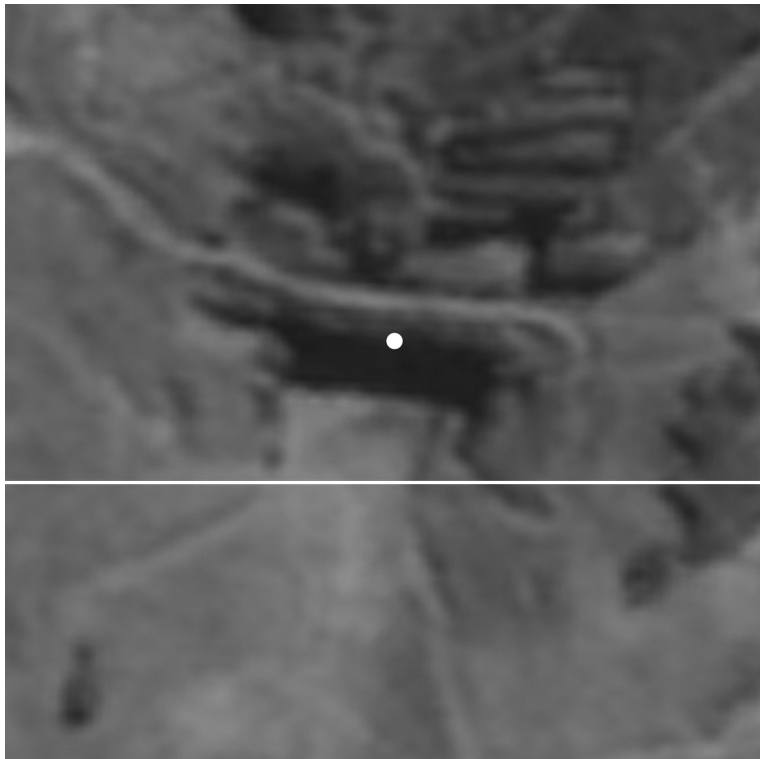
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Appendix 1. Catalogue of eye petroglyphs identified at Rano Raraku

Colour aerial photographs *Google Earth* © 2014 *DigitalGlobe*; black and white aerial photographs © 2004 *IGM*

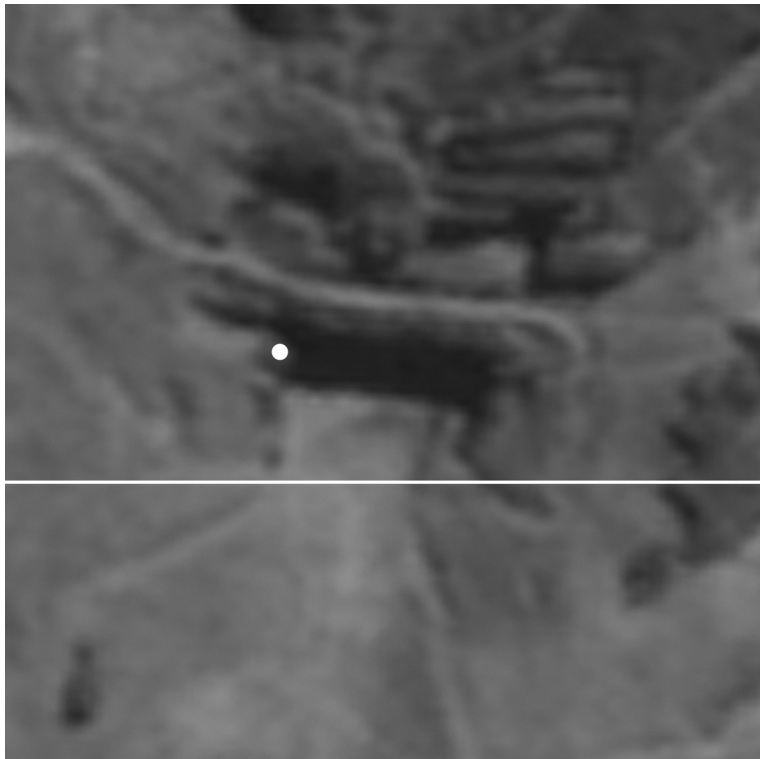

LOC number: E01


<i>Location</i>	
UTM (WGS84) grid reference: 669754/6998414	
Position on volcano: exterior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: centre of rear wall of quarry bay	
Vertical position: high	


Comments: none

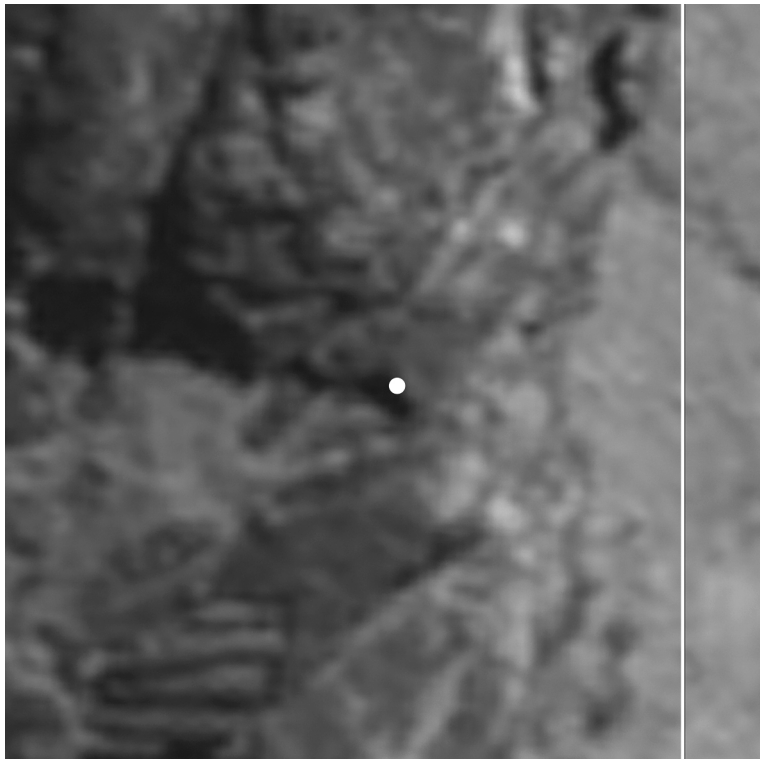

Type/ execution				
Single left eye				
Shape: lenticular				
Slant: none				
Method of carving: incised (outline) grading into positive relief (the eyeball)				
Dimensions: see photo				
Comments: deeply cut				
Condition/ visibility				
Visibility: clearly visible				
Weathering: moderate to heavy (at the bottom of the eye)	Matrix removal: across whole eye — severe towards the bottom	Lichen: patchy white and grey lichen (c. 50%)	Silica reprecipitation: present but difficult to distinguish from lichen owing to height of eye	
Associations				
Associated <i>moai</i>	7, 10 and 11. 10 and 11 are supine and lie at right angles to E01's gaze, 10 in front of it and 11 undercut below it; 7, to the right, lies approximately parallel to it. All are attached			
Evidence of <i>moai</i> removal	Space in front for one or more extracted <i>moai</i> . On both side walls are steps probably indicative of the removal of a <i>moai</i> from above 10			
Petroglyphs	A major complex of petroglyphs, including E02 and A07 (see Appendix 2) as well as canoe and frigate bird motifs, is located on the left wall of the quarry bay			
Wider context				
Local outlook: it overlooks but does not look at several standing <i>moai</i>				
Regional outlook: the sea				
Other Comments	Visually impressive quarry bay			


LOC number: E02

Location	
UTM (WGS84) grid reference: 669746/6998414	
Position on volcano: exterior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: left wall of quarry bay	
Vertical position: middle	
	
Comments	Southernmost eye in exterior quarry

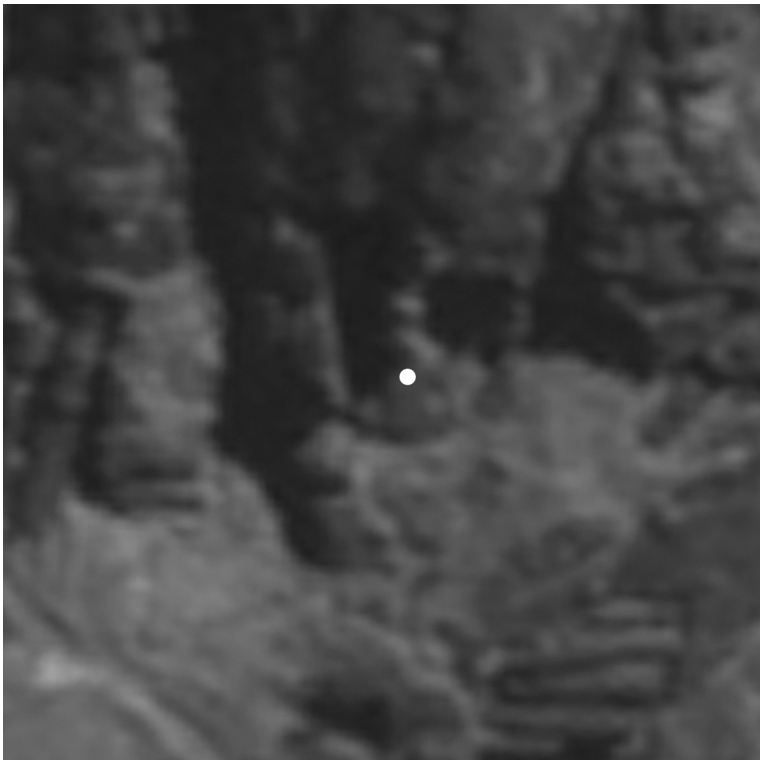
Type/ execution			
Pair of eyes			
Shape: lenticular and/or round with downturned 'flicks'			
Slant: left eye downward slanting			
Method of carving: incised			
Dimensions: see photo			
Comments: asymmetrical; shallowly cut			
Condition/ visibility			
Visibility: lower left eye not present but otherwise clearly visible			
Weathering: moderate to heavy	Matrix removal: mostly moderate but severe patches on both eyes	Lichen: patchy white lichen on right eye (c. 15%)	Silica reprecipitation: thin patchy, slightly flaking silica across both eyes (c. 40%)
Associations			
Associated <i>moai</i>	7, 10 and 11. All are supine and remain attached. 10 and 11 lie parallel to E02's gaze, while 7, which is carved on a slope with its head to the top, lies at right angles to it		
Evidence of <i>moai</i> removal	Space in front for one or more extracted <i>moai</i> . On both side walls are steps probably indicative of the removal of a <i>moai</i> from above 10		
Petroglyphs	Shares the wall with a major complex of petroglyphs including A07 (see Appendix 2) and canoe and frigate bird motifs. E01 is located on the adjacent quarry wall		
Wider context			
Local outlook: looks along <i>moai</i> 10 from its foot to its head towards <i>moai</i> 7			
Regional outlook: none			
Other Comments	Visually impressive quarry bay		


LOC number: E03


Location	
UTM (WGS84) grid reference: 669781/6998448	
Position on volcano: exterior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: right wall of quarry bay	
Vertical position: middle	
	
Comments	Quarry bay has no left wall. Easternmost eye in exterior quarry

Type/ execution			
Single clearly visible (left) eye of possible pair			
Shape: oval			
Slant: none			
Method of carving: incised			
Dimensions: see photo			
Comments: traces of possible lenticular right eye			
Condition/ visibility			
Visibility: clear in the afternoon but almost invisible in the morning			
Weathering: heavy	Matrix removal: severe across the visible eye	Lichen: white and orange lichen covers most (c. 80%) of the visible eye	Silica reprecipitation: not obviously present
Associations			
Associated <i>moai</i>	23, the unfinished head of which is immediately below E03, lies parallel to its gaze. 23 is supine, remains attached and has been truncated at the base by 25		
Evidence of <i>moai</i> removal	Space in bay for one or more extracted <i>moai</i>		
Petroglyphs	None		
Wider context			
Local outlook: looks along <i>moai</i> 23 from its head to its foot towards <i>moai</i> 25 and the quarried area beyond			
Regional outlook: Rano Kau			
Other Comments	None		

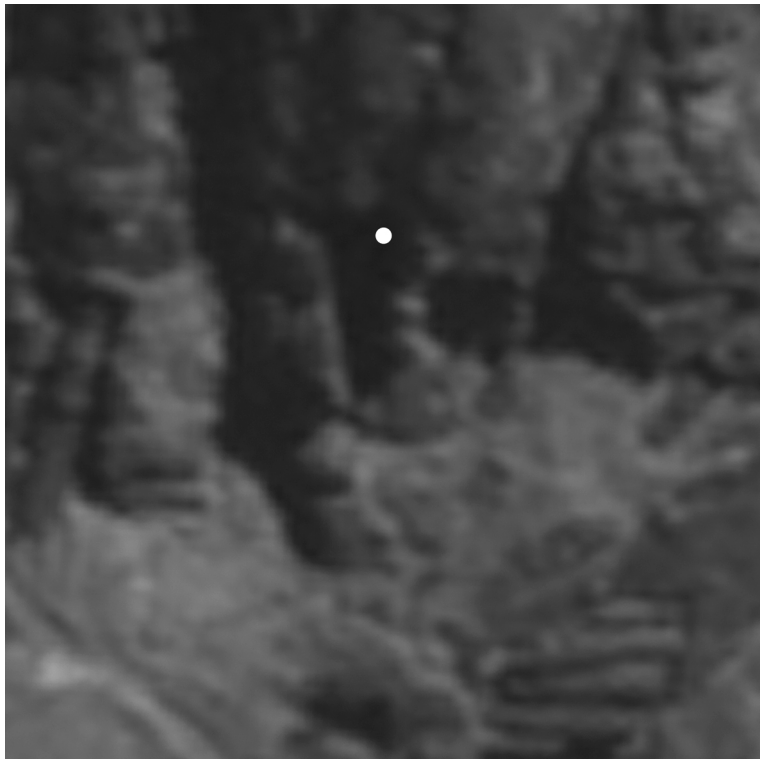

LOC number: E04


Location	
UTM (WGS84) grid reference: 669750/6998426	
Position on volcano: exterior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: between quarry bays	
Vertical position: low	

	
Comments	Located near the centre of the wall with plenty of room for another eye. Difficult to obtain precise grid reference owing to depth of quarrying and shadow on <i>Google Earth</i> imagery

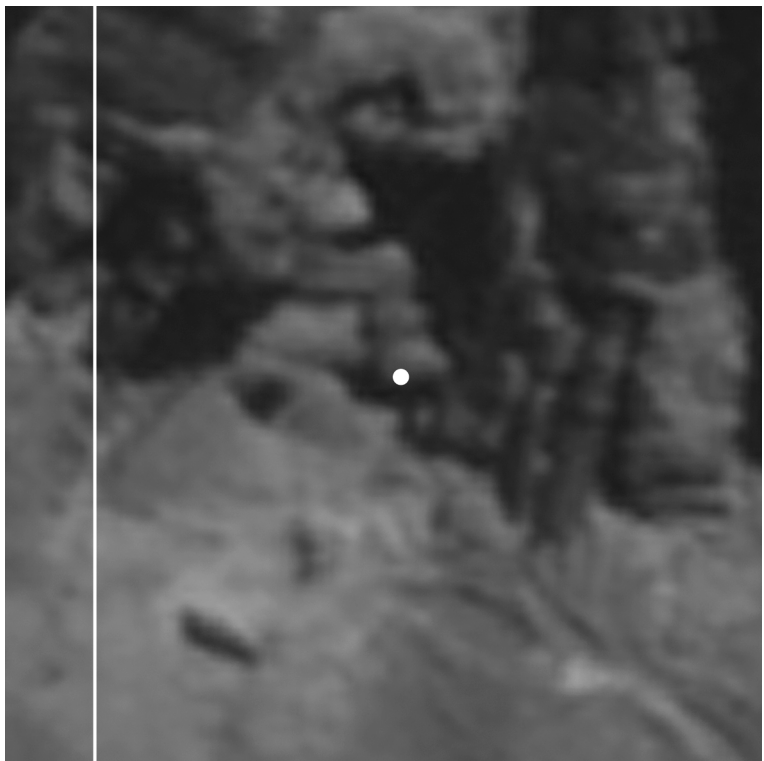
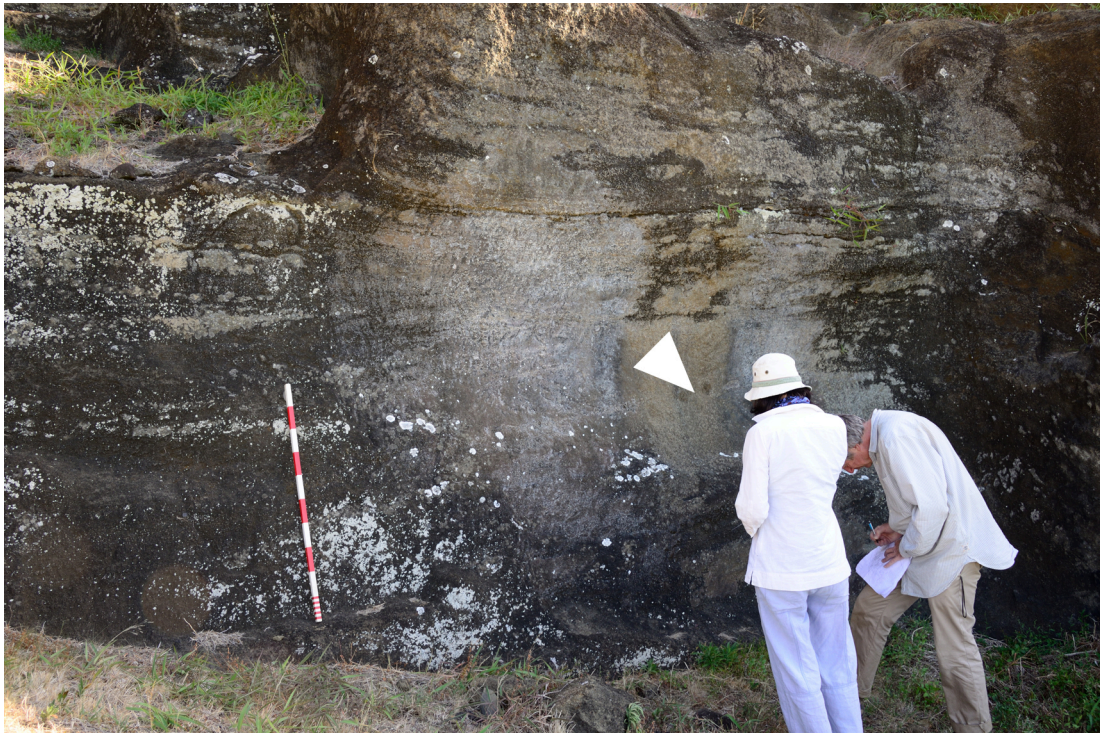
Type/ execution			
Single (left) eye			
Shape: lenticular			
Slant: downward			
Method of carving: incised			
Dimensions: see photo			
Comments: <i>not</i> part of a truncated pair; shallowly cut			
Condition/ visibility			
Visibility: clearly visible in favorable light			
Weathering: moderate to heavy	Matrix removal: severe at the top of the eye, moderate below	Lichen: white lichen at the top of the eye (c. 5%)	Silica reprecipitation: thick encrustation at the bottom of the eye (c. 20%); patchy and thinner elsewhere
Associations			
Associated <i>moai</i>	No immediate associations. It is flanked at some distance by 26 and 27, both of which are supine. 26, to the right, is attached, and 27, behind it and to the left, is detached		
Evidence of <i>moai</i> removal	The very high quarry wall on which the eye is located strongly suggests the extraction of one and probably more <i>moai</i> from this location		
Petroglyphs	An incised horizontal line immediately above		
Wider context			
Local outlook: the empty quarry and, downhill, spoil heaps and standing <i>moai</i>			
Regional outlook: the sea			
Other Comments	E04 appears to cut pre-existing tool marks		


LOC number: E05

Location	
UTM (WGS84) grid reference: 669754/6998451	
Position on volcano: exterior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: right wall of quarry bay	
Vertical position: middle	
	
Comments	Difficult to obtain precise grid reference owing to depth of quarrying and shadow on Google Earth imagery

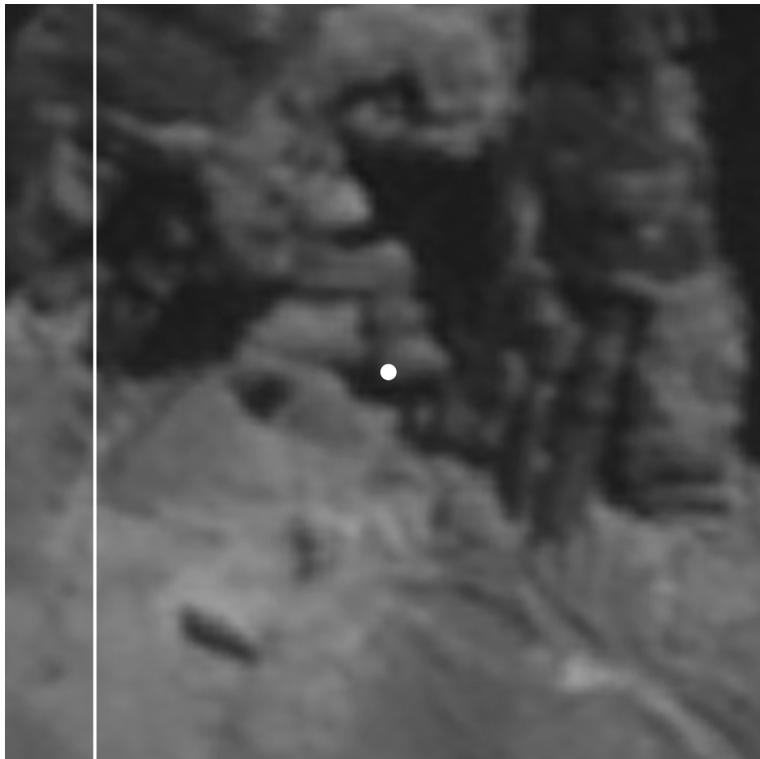

Type/ execution			
Pair of eyes			
Shape: lenticular			
Slant: none			
Method of carving: incised			
Dimensions: see photo			
Comments: deeply cut			
Condition/ visibility			
Visibility: clearly visible			
Weathering: light to moderate	Matrix removal: moderate across both eyes	Lichen: patchy white and orange lichen across both eyes (c. 20%)	Silica reprecipitation: present
Associations			
Associated <i>moai</i>	Supine detached <i>moai</i> 27 lies immediately below E05 at right angles to its gaze		
Evidence of <i>moai</i> removal	Space in the bay for at least two extracted <i>moai</i> , one above 27 and one down slope of it. On both side walls are steps indicative of the removal one immediately above 27		
Petroglyphs	None		
Wider context			
Local outlook: looks directly across the face of <i>moai</i> 27 at the quarry wall opposite			
Regional outlook: none			
Other Comments	Private location		

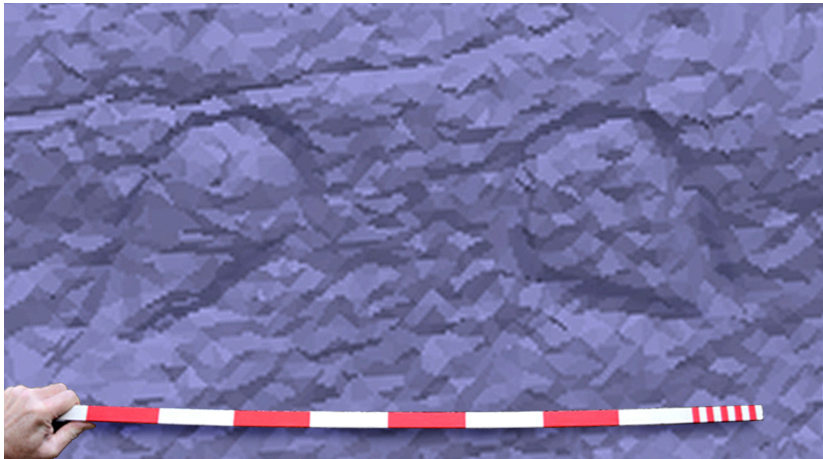
LOC number: E06

Location	
UTM (WGS84) grid reference: 669711/6998450	
Position on volcano: exterior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: right rear of quarry bay	
Vertical position: low	
	
Comments	None

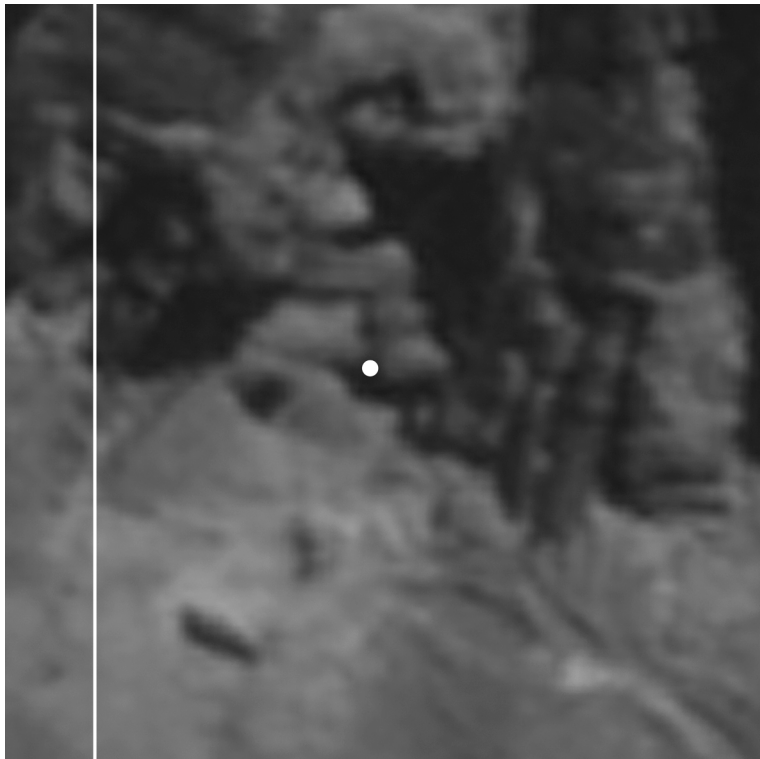

Type/ execution				
Pair of eyes				
Shape: rounded				
Slant: not applicable				
Method of carving: negative relief				
Dimensions: see photo				
Comments: possibly cup marks, not eyes				
Condition/ visibility				
Visibility: right eye clearly visible, left eye faint				
Weathering: left eye heavy, right eye moderate	Matrix removal: severe on left eye, moderate on right eye	Lichen: none	Silica reprecipitation: slight	
Associations				
Associated <i>moai</i>	Attached supine <i>moai</i> 43 on top of side wall to the right. It lies parallel to E06's gaze			
Evidence of <i>moai</i> removal	Space in empty bay for one or more extracted <i>moai</i> . E06 located above a step and below an undercut indicative of previous <i>moai</i> extraction			
Petroglyphs	E07 and E08			
Wider context				
Local outlook: mouth of quarry bay, detached supine <i>moai</i> 44 and spoil heaps				
Regional outlook: the sea				
Other Comments	These are the closest Rano Raraku parallel for the pair of eyes identified at Puna Pau			


LOC number: E07

Location	
UTM (WGS84) grid reference: 669711/6998450	
Position on volcano: exterior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: right rear of quarry bay	
Vertical position: middle	
	
Comments	None



Type/ execution			
Pair of eyes			
Shape: lenticular			
Slant: downward			
Method of carving: incised with left eye in positive relief			
Dimensions: see photo			
Comments: deeply cut			
Condition/ visibility			
Visibility: very difficult to see			
Weathering: heavy	Matrix removal: severe across both eyes	Lichen: none	Silica reprecipitation: thick flaky encrustation on left eye (c. 40% of petroglyph)
Associations			
Associated <i>moai</i>	Attached supine <i>moai</i> 43 on top of side wall to the right. It lies parallel to E07's gaze		
Evidence of <i>moai</i> removal	Space in empty bay for one or more extracted <i>moai</i> . E07 located above step and below undercut indicative of previous <i>moai</i> extraction		
Petroglyphs	E06 and E08		
Wider context			
Local outlook: mouth of quarry bay, detached supine <i>moai</i> 44 and spoil heaps			
Regional outlook: the sea			
Other Comments	Identified from 3-D imagery		


LOC number: E08

Location	
UTM (WGS84) grid reference: 669707/6998445	
Position on volcano: exterior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: left rear of (visible) quarry bay	
Vertical position: middle	
	
Comments	The lateral extent of the bay is uncertain owing to its partial filling by spoil



Type/ execution			
Single (left) eye			
Shape: lenticular with upturned 'flick'			
Slant: none			
Method of carving: incised			
Dimensions: see photo			
Comments: deeply cut			
Condition/ visibility			
Visibility: clearly visible			
Weathering: moderate to heavy	Matrix removal: severe towards base of eye, moderate above	Lichen: white lichen across the top of the eye and patches of grey lichen below (c. 25%)	Silica reprecipitation: very slight
Associations			
Associated <i>moai</i>	Attached supine <i>moai</i> 43 on top of side wall to the right. It lies parallel to E08's gaze		
Evidence of <i>moai</i> removal	Space in empty bay for one or more extracted <i>moai</i> . E08 located adjacent to undercut indicative of previous <i>moai</i> extraction		
Petroglyphs	E06 and E07. Underlain by horizontal zig-zag motif		
Wider context			
Local outlook: mouth of quarry bay, detached supine <i>moai</i> 44 and spoil heaps			
Regional outlook: the sea			
Other Comments	None		


LOC number: E09

Location	
UTM (WGS84) grid reference: 669721/6996458	
Position on volcano: exterior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: right rear of quarry bay	
Vertical position: middle	
	
Comments	Difficult to obtain precise grid reference owing to depth of quarrying and shadow on <i>Google Earth</i> imagery

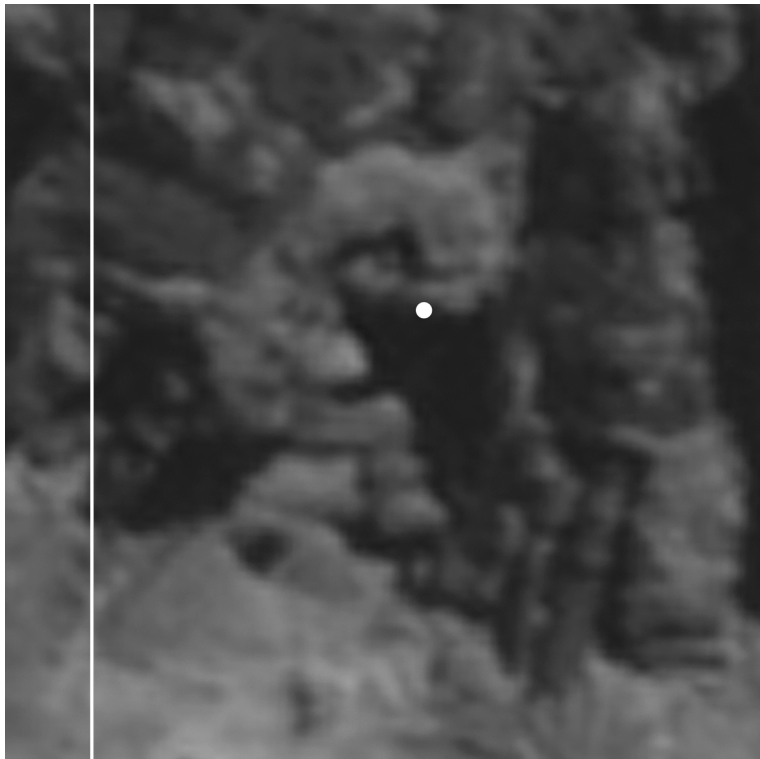

Type/ execution				
Single clearly visible (left) eye of possible pair				
Shape: lenticular				
Slant: downward				
Method of carving: incised				
Dimensions: see photo				
Comments: traces of possible lenticular right eye; shallowly cut				
Condition/ visibility				
Visibility: clearly visible				
Weathering: light to moderate	Matrix removal: slight to moderate across eye	Lichen: small patches of white lichen (c. 5%)	Silica reprecipitation: concentrated to the right of the eye and in the tool marks (c. 50%)	
Comments	The whole eye is covered in a red deposit of uncertain but probable organic origin. The possible right eye is only visible in the afternoon			
Associations				
Associated <i>moai</i>	None			
Evidence of <i>moai</i> removal	Space in empty bay for several extracted <i>moai</i> . There are various steps and undercuts but none directly associated with E09			
Petroglyphs	E10 and E11 above and E12 above and to the left			
Wider context				
Local outlook: the quarry bay and, downhill, spoil heaps and standing and recumbent <i>moai</i>				
Regional outlook: the sea				
Other Comments	Associated with well-preserved tool marks			

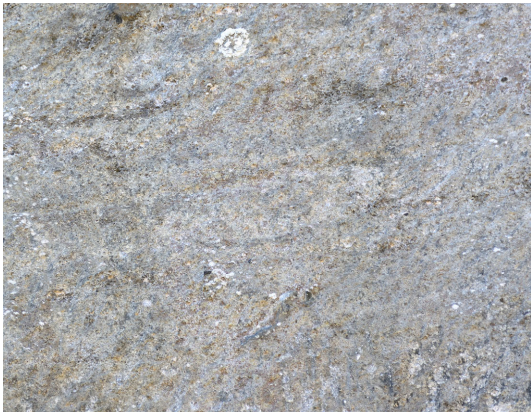
LOC number: E10

Location	
UTM (WGS84) grid reference: 669721/6996458	
Position on volcano: exterior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: right rear of quarry bay	
Vertical position: high	
	
Comments	Difficult to obtain precise grid reference owing to depth of quarrying and shadow on <i>Google Earth</i> imagery



Type/ execution			
Single (right) eye			
Shape: lenticular			
Slant: none			
Method of carving: incised			
Dimensions: 25 x 16 cm (estimate)			
Comments: none			
Condition/ visibility			
Visibility: clearly visible			
Weathering: light to moderate	Matrix removal: slight with moderate to severe patch at the middle bottom of the eye	Lichen: none	Silica reprecipitation: probably extensive (c. 70%) but difficult to assess with certainty owing to height of eye
Associations			
Associated <i>moai</i>	None		
Evidence of <i>moai</i> removal	Space in empty bay for several extracted <i>moai</i> . E10 is on an undercut above a pronounced step, both indicative of specific <i>moai</i> extractions		
Petroglyphs	E09 and E11 below and E12 to the left		
Wider context			
Local outlook: the quarry bay and, downhill, spoil heaps and standing and recumbent <i>moai</i>			
Regional outlook: the sea			
Other Comments	Difficult to assess owing to height. Very high and possibly of early date, i.e. it was cut before <i>moai</i> extraction reached below it		


LOC number: E11

Location	
UTM (WGS84) grid reference: 669721/6996458	
Position on volcano: exterior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: centre of rear wall of quarry bay	
Vertical position: high	
	
Comments	Difficult to obtain precise grid reference owing to depth of quarrying and shadow on <i>Google Earth</i> imagery



Type/ execution			
Single eye			
Shape: oval			
Slant: none			
Method of carving: incised			
Dimensions: 30 x 12 cm (estimate)			
Comments: not certainly an eye			
Condition/ visibility			
Visibility: very faint			
Weathering: uncertain owing to height of eye	Matrix removal: unknown	Lichen: none	Silica reprecipitation: severity uncertain but covers in excess of 60% of the eye
Associations			
Associated <i>moai</i>	None		
Evidence of <i>moai</i> removal	Space in empty bay for several extracted <i>moai</i> . E11 is on an undercut above a pronounced step, both indicative of specific extractions		
Petroglyphs	E09 below, E10 above and E12 to the left		
Wider context			
Local outlook: the quarry bay and, downhill, spoil heaps and standing and recumbent <i>moai</i>			
Regional outlook: the sea			
Other Comments	Difficult to assess owing to height. Like E10, very high in bay and possibly of early date, i.e. it was cut before <i>moai</i> extraction reached below it		


LOC number: E12

Location	
UTM (WGS84) grid reference: 669713/6998454	
Position on volcano: exterior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: (?)left rear of truncated bay (the exact morphology of bay(s) when the carving was made cannot be reconstructed	
Vertical position: high	
	
Comments	Difficult to obtain precise grid reference owing to depth of quarrying and shadow on <i>Google Earth</i> imagery



Type/ execution			
Pair of eyes			
Shape: lenticular			
Slant: downwards			
Method of carving: incised			
Dimensions: left eye 32 x 13 cm, gap 15 cm, right eye 32 x 15 cm (estimate)			
Comments: shallowly cut			
Condition/ visibility			
Visibility: sharply defined but nonetheless difficult to see			
Weathering: moderate	Matrix removal: uncertain	Lichen: patchy white lichen on left eye (c. 10%)	Silica reprecipitation: uncertain
Comments	Covered with a grey deposit. At a distance it is impossible to say whether this is lichen or silica reprecipitation		
Associations			
Associated <i>moai</i>	Truncated attached supine <i>moai</i> 46 below and to the left		
Evidence of <i>moai</i> removal	Space in bay for several extracted <i>moai</i>		
Petroglyphs	None		
Wider context			
Local outlook: the quarry bay and, downhill, spoil heaps and standing and recumbent <i>moai</i>			
Regional outlook: the sea			
Other Comments	Difficult to assess owing to height. Very high in bay and possibly of early date, i.e. it was cut before <i>moai</i> extraction reached below it		


LOC number: E13

Location	
UTM (WGS84) grid reference: 669715/6998465	
Position on volcano: exterior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: left wall of quarry bay	
Vertical position: uncertain	
	
Comments	Difficult to obtain precise grid reference owing to depth of quarrying and shadow on <i>Google Earth</i> imagery

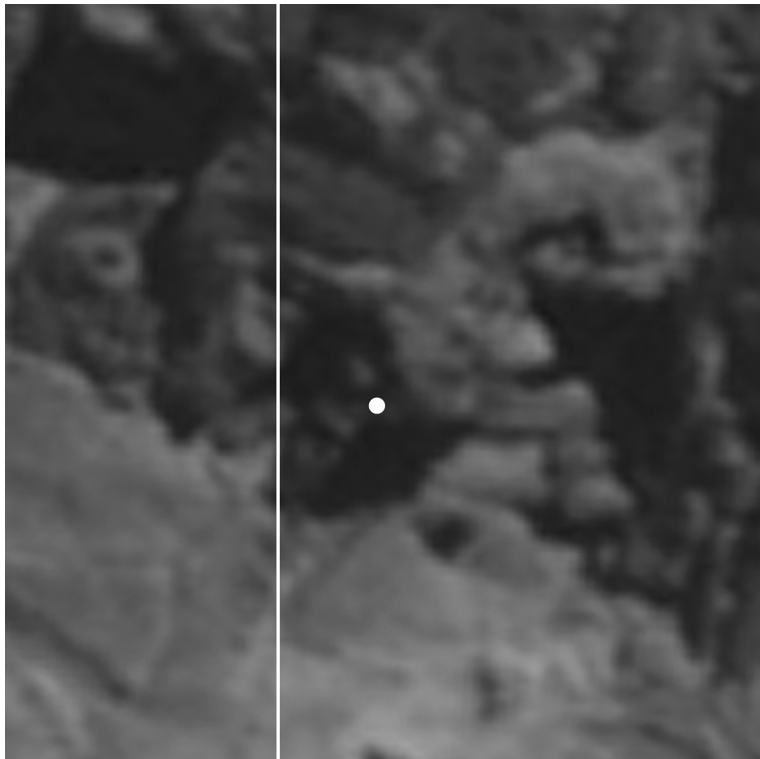

Type/ execution			
Single (right) eye			
Shape: lenticular			
Slant: downward			
Method of carving: incised			
Dimensions: uncertain but looks big			
Comments: possibly part of widely spaced pair with E14			
Condition/ visibility			
Visibility: clearly visible			
Weathering: moderate to heavy (edges appear very rounded) but difficult to assess owing to height	Matrix removal: moderate across eye	Lichen: rare (c. 5–10%) patchy white lichen	Silica reprecipitation: unknown
Associations			
Associated <i>moai</i>	Attached supine <i>moai</i> 41, some distance to the left		
Evidence of <i>moai</i> removal	Space in bay for at least one extracted <i>moai</i>		
Petroglyphs	E14 and E21		
Wider context			
Local outlook: the mouth of the quarry bay			
Regional outlook: none			
Other Comments	Difficult to assess owing to inaccessibility of the bay. Very private location		


LOC number: E14

Location	
UTM (WGS84) grid reference: 669715/6998465	
Position on volcano: exterior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: left wall of quarry bay	
Vertical position: unknown	
	
Comments	Difficult to obtain precise grid reference owing to depth of quarrying and shadow on <i>Google Earth</i> imagery

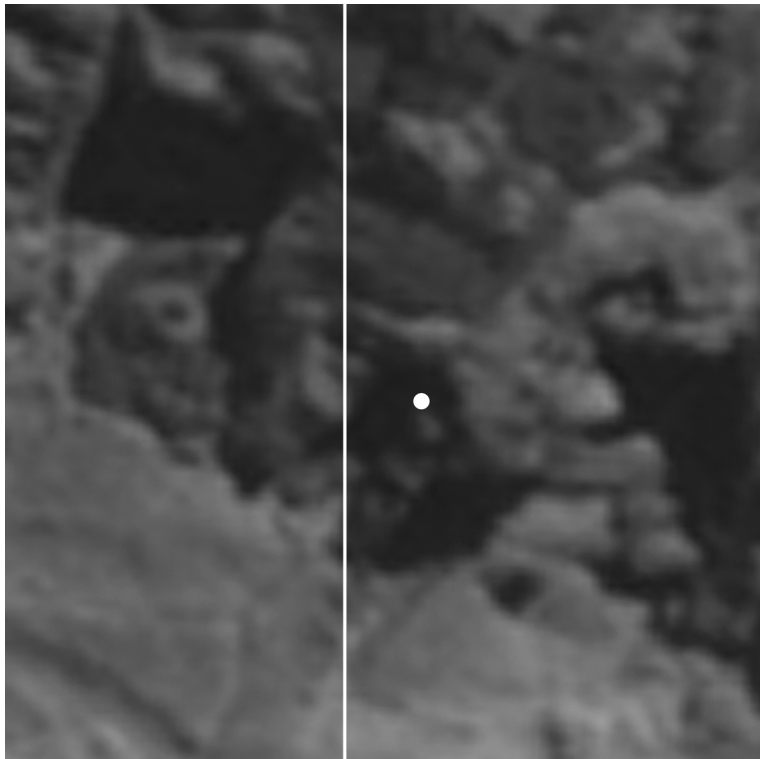
Type/ execution			
Single (left) eye			
Shape: lenticular			
Slant: downward			
Method of carving: incised			
Dimensions: unknown			
Comments: possibly part of a widely spaced pair with E13 or E21			
Condition/ visibility			
Visibility: clearly visible			
Weathering: heavy	Matrix removal: severe	Lichen: rare patchy white lichen (c. 5%)	Silica reprecipitation: present
Comments	Covered with a grey deposit. At a distance it is impossible to say whether this is lichen or silica reprecipitation		
Associations			
Associated <i>moai</i>	Attached supine <i>moai</i> 41, some distance to the left		
Evidence of <i>moai</i> removal	Space in bay for at least one extracted <i>moai</i>		
Petroglyphs	E14 and E21		
Wider context			
Local outlook: the mouth of the quarry bay			
Regional outlook: none			
Other Comments	Difficult to assess owing to inaccessibility of the bay. Very private location		


LOC number: E15


Location	
UTM (WGS84) grid reference: 669706/6998454	
Position on volcano: exterior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: left wall of quarry bay	
Vertical position: middle	
	
Comments	Difficult to obtain precise grid reference owing to depth of quarrying and shadow on <i>Google Earth</i> imagery

Type/ execution			
Single (right) eye			
Shape: lenticular			
Slant: none			
Method of carving: incised (outline) grading into positive relief (the eyeball)			
Dimensions: see photo			
Comments: none			
Condition/ visibility			
Visibility: clearly visible			
Weathering: light to moderate	Matrix removal: slight to moderate	Lichen: none	Silica reprecipitation: patchy moderate to severe encrustation (c. 60%) with some flaking
Associations			
Associated <i>moai</i>	47 and 48. Both are supine and attached and lie a right angles to E15's gaze		
Evidence of <i>moai</i> removal	Space in bay for several extracted <i>moai</i> . Remnant keel between the eye and <i>moai</i> 48 (Figure 7)		
Petroglyphs	None		
Wider context			
Local outlook: looks directly across the face of <i>moai</i> 48 and the quarry bay			
Regional outlook: none			
Other Comments	None		

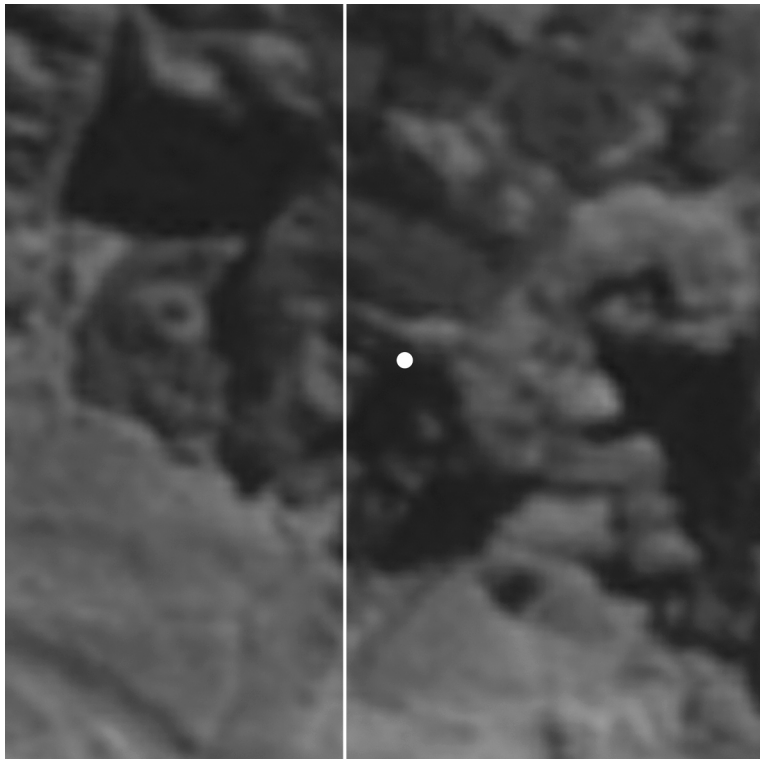
LOC number: E16


Location	
UTM (WGS84) grid reference: 669703/6998457	
Position on volcano: exterior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: right wall of quarry bay	
Vertical position: middle	


	
Comments	Difficult to obtain precise grid reference owing to depth of quarrying and shadow on <i>Google Earth</i> imagery

Type/ execution				
Single eye				
Shape: oval				
Slant: none				
Method of carving: incised				
Dimensions: see photo				
Comments: vertical, nose-like incision towards centre of eye — possibly a Make Make face, not an eye				
Condition/ visibility				
Visibility: clearly visible				
Weathering: heavy	Matrix removal: moderate to severe (particularly towards the top of the eye)	Lichen: patchy lichen of varying colours covers most of the eye (c. 80%)	Silica reprecipitation: present but extent uncertain	
Associations				
Associated <i>moai</i>	None			
Evidence of <i>moai</i> removal	Empty bay with remnant keel			
Petroglyphs	E17 on adjacent bay wall. Incised line on opposite wall of quarry bay			
Wider context				
Local outlook: the opposite wall of the quarry bay				
Regional outlook: none				
Other Comments	Private location			

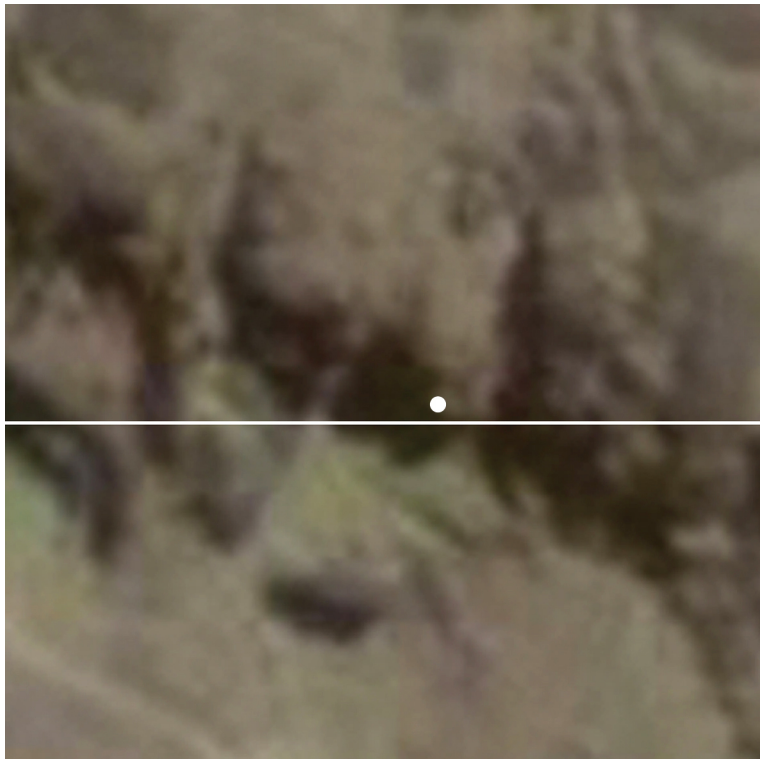

LOC number: E17


Location	
UTM (WGS84) grid reference: 669703/6998461	
Position on volcano: exterior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: left rear of quarry bay	
Vertical position: middle	

	
Comments	Difficult to obtain precise grid reference owing to depth of quarrying and shadow on <i>Google Earth</i> imagery

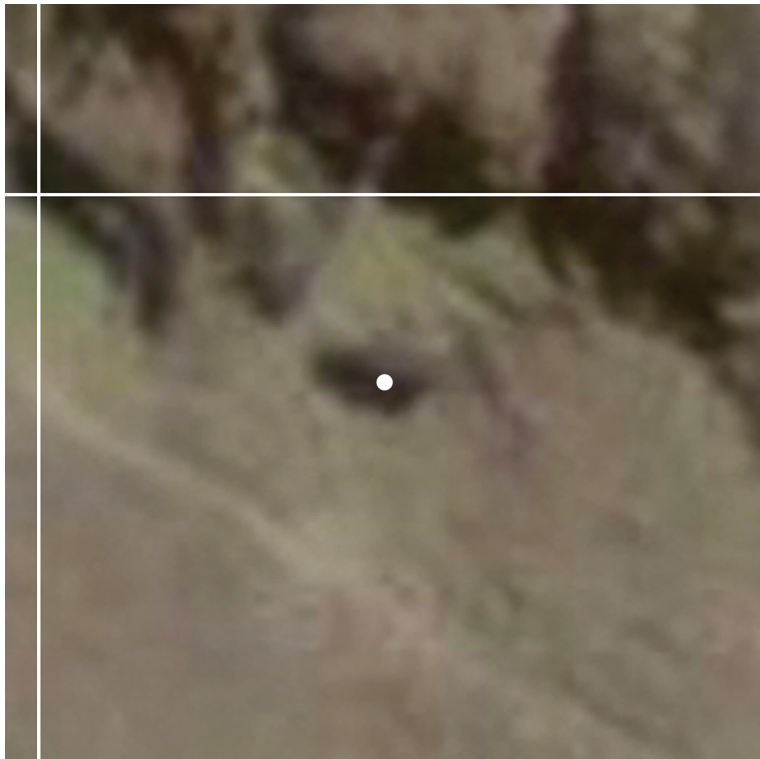
Type/ execution				
Single (right) eye				
Shape: lenticular				
Slant: downward				
Method of carving: incised				
Dimensions: see photo				
Comments: shallowly cut				
Condition/ visibility				
Visibility: clearly visible				
Weathering: slight to moderate	Matrix removal: slight	Lichen: very rare patchy white lichen (<5%)	Silica reprecipitation: across most of the eye with a thick encrustation at the top	
Comments	Red deposit of uncertain but probable organic origin (cf. E09)			
Associations				
Associated <i>moai</i>	None			
Evidence of <i>moai</i> removal	Empty bay with remnant keel			
Petroglyphs	E16 on adjacent bay wall			
Wider context				
Local outlook: mouth of quarry bay, spoil heaps and standing <i>moai</i>				
Regional outlook: the sea				
Other Comments	Private location			


LOC number: E18


Location	
UTM (WGS84) grid reference: 669627/6998507	
Position on volcano: exterior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: centre of rear wall of quarry bay	
Vertical position: high	
	
Comments	None

Type/ execution			
Pair of eyes			
Shape: lenticular			
Slant: upward			
Method of carving: incised grading into positive relief			
Dimensions: see photo			
Comments: deeply cut, the apparent relief probably due to weathering			
Condition/ visibility			
Visibility: clearly visible			
Weathering: moderate to severe	Matrix removal: moderate to severe across both eyes	Lichen: very rare patchy white lichen (<5%)	Silica reprecipitation: patchy on left eye and across most of right eye (c. 70% of total area)
Associations			
Associated <i>moai</i>	None in immediate association. Supine <i>moai</i> 85 lies at right angles to its gaze just downslope and 88 and 89 are in a side bay to the left		
Evidence of <i>moai</i> removal	Cut on undercut in an almost empty bay with space for several extracted <i>moai</i>		
Petroglyphs	None		
Wider context			
Local outlook: the quarry bay, <i>moai</i> blank above E19 and, beyond that, spoil heaps and standing and recumbent <i>moai</i>			
Regional outlook: the southern <i>Ara Moai</i> and the sea			
Other Comments	None		


LOC number: E19


Location	
UTM (WGS84) grid reference: 669622/6998490	
Position on volcano: exterior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: centre of rear wall of quarry bay	
Vertical position: middle	

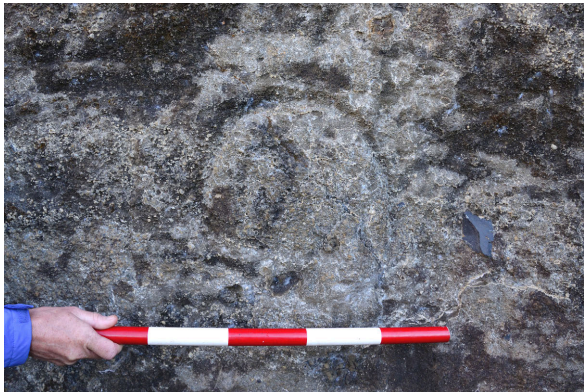
	
Comments	On step/ ledge on quarry wall

Type/ execution				
Single clearly visible (right) eye of possible pair				
Shape: lenticular				
Slant: none				
Method of carving: in positive relief				
Dimensions: see photo				
Comments: none				
Condition/ visibility				
Visibility: clearly visible				
Weathering: light at the top of the eye, moderate to heavy at the bottom of the eye	Matrix removal: moderate to heavy at the bottom of the eye	Lichen: speckled with small patches of grey and white lichen (10%)	Silica reprecipitation: patchy (c. 5%) and thin	
Comments	The bottom of the eye is laminating			
Associations				
Associated <i>moai</i>	<i>Moai</i> blank immediately above			
Evidence of <i>moai</i> removal	Space in empty bay for several <i>moai</i> extractions. The step on which E19 is cut and another above it probably relate to specific extractions			
Petroglyphs	None			
Wider context				
Local outlook: empty mouth of quarry bay				
Regional outlook: the sea				
Other Comments	The <i>moai</i> in the lower quarry are mostly obscured by the outer lip of the quarry bay			



LOC number: E20


Location	
UTM (WGS84) grid reference: 669557/6998536	
Position on volcano: exterior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: right rear of quarry bay	
Vertical position: middle	

	
Comments	Northern and westernmost eye in exterior quarry

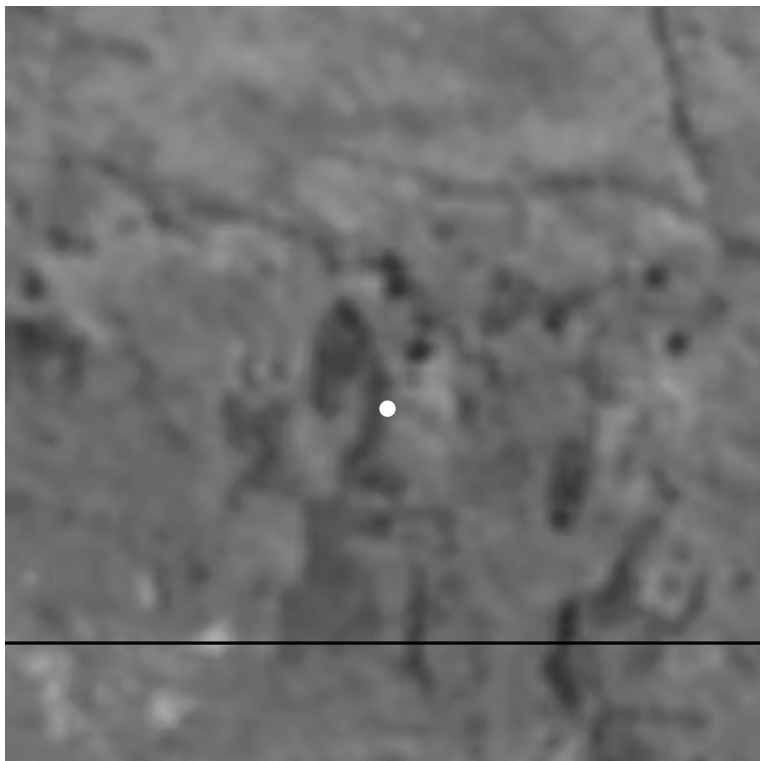
Type/ execution				
Single (left) eye				
Shape: sub-round				
Slant: none				
Method of carving: incised				
Dimensions: see photo				
Comments: shallowly cut				
Condition/ visibility				
Visibility: clearly visible				
Weathering: moderate to severe	Matrix removal: moderate to severe on the left of the eye	Lichen: none	Silica reprecipitation: severe encrustation (c. 90%) with some flaking	
Associations				
Associated <i>moai</i>	None in immediate association. 123, lying at right angles to its gaze, is to the left			
Evidence of <i>moai</i> removal	Space in bay for one or more <i>moai</i> extraction			
Petroglyphs	None			
Wider context				
Local outlook: empty mouth of quarry bay				
Regional outlook: the southern <i>Ara Moai</i> , Maunga Toa Toa and the sea				
<i>Other Comments</i>	None			


LOC number: E21


Location	
UTM (WGS84) grid reference: 669715/6998465	
Position on volcano: exterior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: left side of quarry bay	
Vertical position: unknown	
	
Comments	None

Type/ execution			
Single clearly visible (right) eye of possible pair			
Shape: lenticular			
Slant: downward			
Method of carving: incised			
Dimensions: unknown			
Comments: possibly part of a widely spaced pair with E13; shallowly cut			
Condition/ visibility			
Visibility: faint (not spotted in the field at all by the present writer)			
Weathering: moderate to heavy	Matrix removal: severe to top of eye, moderate elsewhere	Lichen: patchy lichen of varying colours across eye (c. 70%)	Silica reprecipitation: present
Comments	Right side of eye covered with a grey deposit. At a distance it is impossible to say whether this is lichen or silica reprecipitation		
Associations			
Associated <i>moai</i>	Attached supine <i>moai</i> 41, some distance to the left		
Evidence of <i>moai</i> removal	Space in bay for at least one extracted <i>moai</i>		
Petroglyphs	E13 and E14		
Wider context			
Local outlook: the mouth of the quarry bay and that beyond			
Regional outlook: none			
Other Comments	Difficult to assess owing to inaccessibility of the bay. Very private location		

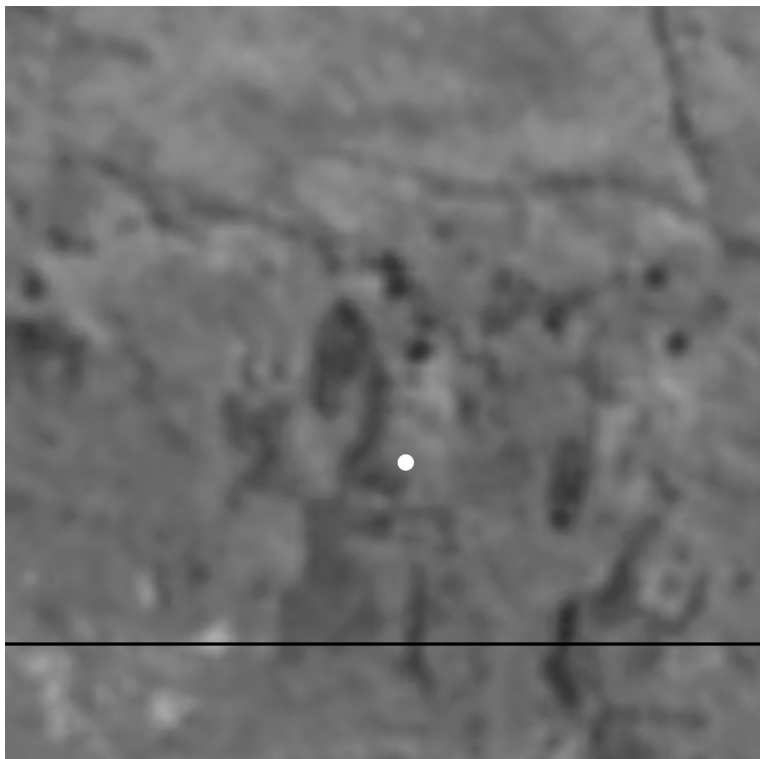
LOC number: I01


Location	
UTM (WGS84) grid reference: 669570/6998673	
Position on volcano: interior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: right wall of quarry bay	
Vertical position: low	


	
Comments	Westernmost eye in interior quarry

Type/ execution			
Single (right) eye			
Shape: lenticular			
Slant: downward			
Method of carving: incised			
Dimensions: see photo			
Comments: possibly part of widely spaced pair with I02; shallowly cut			
Condition/ visibility			
Visibility: clearly visible			
Weathering: heavy	Matrix removal: moderate across eye	Lichen: none	Silica reprecipitation: slight encrustation across c. 70% of the eye
Associations			
Associated <i>moai</i>	I01 is located immediately below the upper shoulder of an attached supine <i>moai</i> (Tilburg no. 11), which lies behind it and at right angles to its gaze. <i>Moai</i> 156 and 157 stand outside the bay		
Evidence of <i>moai</i> removal	Space in bay for at least one extracted <i>moai</i>		
Petroglyphs	I02		
Wider context			
Local outlook: wall of quarry bay			
Regional outlook: none			
Other Comments	I01 would have been destroyed had Tilburg no. 11 been detached. Private location		

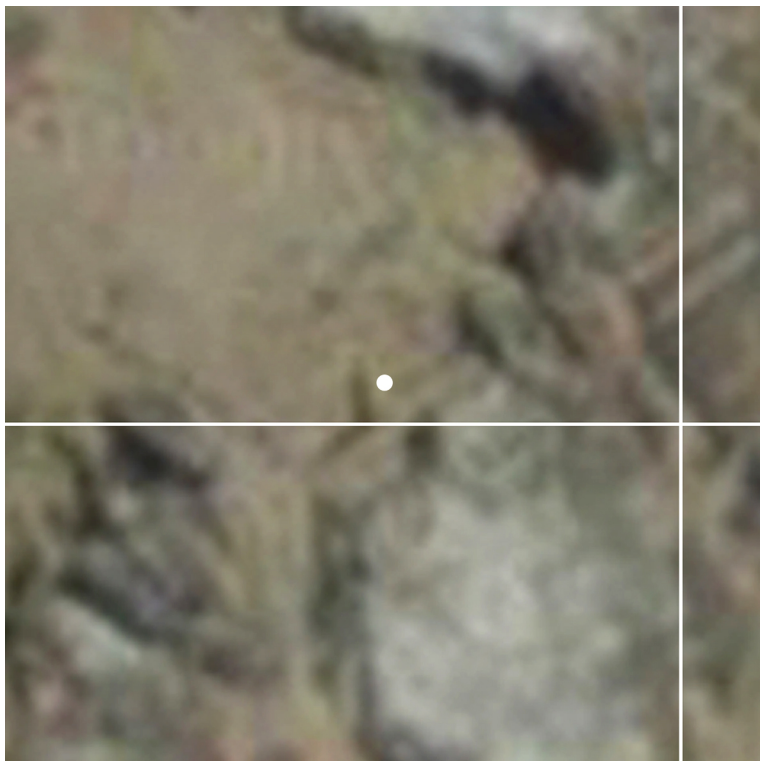
LOC number: I02


Location	
UTM (WGS84) grid reference: 669570/6998673	
Position on volcano: interior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: left wall of rounded quarry bay	
Vertical position: middle	


	
Comments	Possibly cut on panel, indicated by step/ shelf below. Southernmost eye in interior quarry

Type/ execution			
Single (left) eye			
Shape: lenticular			
Slant: downward			
Method of carving: incised			
Dimensions: see photo			
Comments: possibly part of widely spaced pair with I01; shallowly cut			
Condition/ visibility			
Visibility: clearly visible			
Weathering: light to moderate	Matrix removal: severe at base of eye, slight above	Lichen: none	Silica reprecipitation: thin and patchy (c. 20%)
Associations			
Associated <i>moai</i>	Tilburg nos 10 and 11. Standing <i>moai</i> 156 and 157 outside the bay		
Evidence of <i>moai</i> removal	Space in bay for at least one extracted <i>moai</i>		
Petroglyphs	I01		
Wider context			
Local outlook: looks towards Tilburg no. 11 and 10			
Regional outlook: none			
Other Comments	Private location. (?)Recently uncovered		


LOC number: I03


Location	
UTM (WGS84) grid reference: 669755/6998605	
Position on volcano: interior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: right wall of quarry bay	
Vertical position: low	


	
Comments	None

Type/ execution			
Single (right) eye			
Shape: lenticular			
Slant: downward			
Method of carving: incised			
Dimensions: see photo			
Comments: very shallowly cut			
Condition/ visibility			
Visibility: faint			
Weathering: moderate	Matrix removal: slight across eye	Lichen: none	Silica reprecipitation: slight
Associations			
Associated <i>moai</i>	None in immediate association but the left wall of the bay comprises an attached supine <i>moai</i>		
Evidence of <i>moai</i> removal	Space in bay for one <i>moai</i> extraction		
Petroglyphs	Arch/ up-turned canoe motif on adjacent bay wall (A10)		
Wider context			
Local outlook: the stomach of the attached supine moai comprising the left wall of the bay			
Regional outlook: none			
Other Comments	The largest eye identified. Reflects the shape of the quarry bay wall on which it is located		

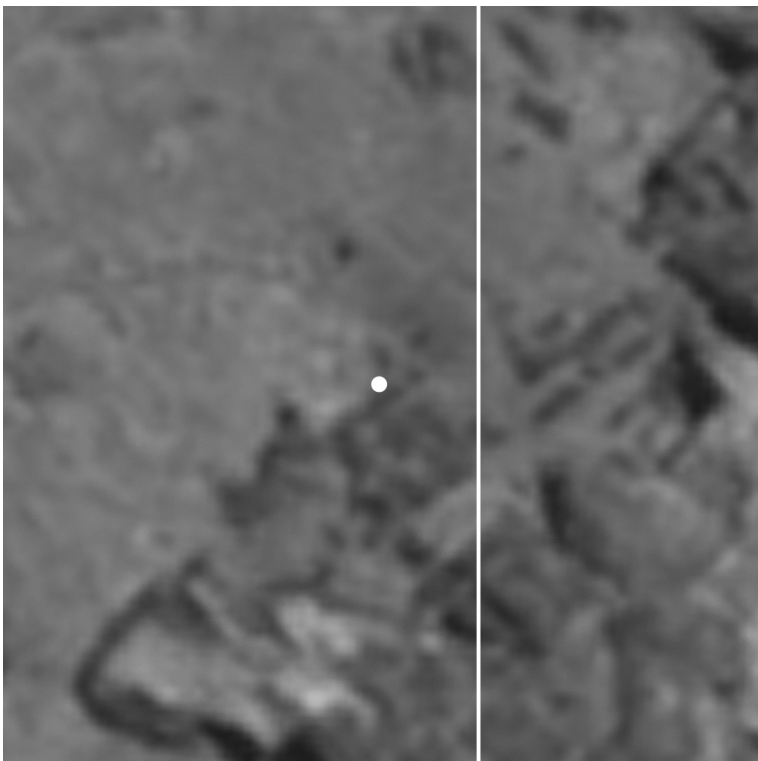
LOC number: I04


Location	
UTM (WGS84) grid reference: 669754/6998612	
Position on volcano: interior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: centre of rear wall of quarry bay	
Vertical position: middle	


	
Comments	None

Type/ execution			
Pair of eyes			
Shape: lenticular			
Slant: none			
Method of carving: incised grading into positive relief			
Dimensions: see photo			
Comments: has both a nose and body — probably Make Make; deeply cut			
Condition/ visibility			
Visibility: clearly visible in the afternoon but difficult to see in the morning			
Weathering; light to moderate	Matrix removal: severe towards the top of the eyes, slight below	Lichen: none	Silica reprecipitation: thin and patchy (c. 35%) across eyes and nose
Associations			
Associated moai	Supine attached moai to the left lying parallel to its gaze		
Evidence of moai removal	Space in bay for several moai extractions		
Petroglyphs	A line of small cup marks runs horizontally across/under the body. There is a faint, possible petroglyph to the left		
Wider context			
Local outlook: empty mouth of quarry bay			
Regional outlook: Rano Raraku lake			
Other Comments	The body is more shallowly cut than the eyes and nose and may have been cut at a different time		


LOC number: I05


Location	
UTM (WGS84) grid reference: 669791/6998649	
Position on volcano: interior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: left rear of quarry bay	
Vertical position: low	

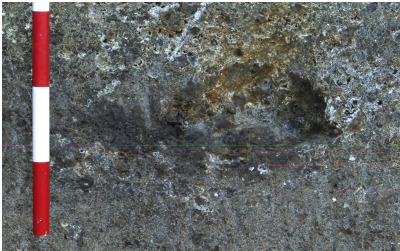
	
Comments	None

Type/ execution			
Pair of eyes			
Shape: lenticular with downturned 'flick'			
Slant: downward			
Method of carving: incised			
Dimensions: see photo			
Comments: shallowly cut			
Condition/ visibility			
Visibility: clearly visible but easily overgrown			
Weathering: moderate to severe	Matrix removal: moderate with severe patches on both eyes	Lichen: none	Silica reprecipitation: thick vertical bands across both eyes (c. 35%)
Associations			
Associated <i>moai</i>	None		
Evidence of <i>moai</i> removal	Space in bay for at least one <i>moai</i> extraction		
Petroglyphs	Adze-like motif on adjacent bay wall (A11)		
Wider context			
Local outlook: mouth of quarry bay and <i>moai</i> head			
Regional outlook: Rano Raraku lake			
Other Comments	None		



LOC number: I06


Location	
UTM (WGS84) grid reference: 669733/6998589	
Position on volcano: interior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: centre of rear wall of quarry bay	
Vertical position: high	

	
Comments	None


Type/ execution			
Single (left) eye			
Shape: lenticular			
Slant: none			
Method of carving: negative relief			
Dimensions: see photo			
Comments: probably artefactual but exact identification uncertain			
Condition/ visibility			
Visibility: clearly visible			
Weathering: moderate	Matrix removal: moderate to severe	Lichen: none	Silica reprecipitation: patchy across eye (c. 50%)
Associations			
Associated <i>moai</i>	Two attached supine <i>moai</i> . One, immediately below the eye, lying at right angles to its gaze, the other, forming the right wall of the quarry bay, lying parallel to its gaze		
Evidence of <i>moai</i> removal	Space in the bay for one or more <i>moai</i> extraction		
Petroglyphs	Make Make face masks on the quarry wall to the left (A03) and on the keel attaching the <i>moai</i> comprising the quarry bay's right wall (A06)		
Wider context			
Local outlook: mouth of quarry bay			
Regional outlook: Rano Raraku lake			
Other Comments	Identified as an eye in 2013, dismissed out of hand by the same surveyor in 2013		


LOC number: I07


Location	
UTM (WGS84) grid reference: 669789/6998677	
Position on volcano: interior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: centre of rear wall of quarry bay	
Vertical position: middle	
	
Comments	Painted graffiti in quarry bay — '1902', " <i>BaQUEDANO</i> ", etc.

Type/ execution			
Pair of eyes			
Shape: lenticular			
Slant: downward			
Method of carving: incised			
Dimensions: see photo			
Comments: asymmetrical; shallowly cut; has distinct carved nose, which pre- or post dates it			
Condition/ visibility			
Visibility: clearly visible			
Weathering: light to moderate	Matrix removal: slight	Lichen: none	Silica reprecipitation: thin and patchy (c. 30%), primarily on the right eye
Associations			
Associated <i>moai</i>	None		
Evidence of <i>moai</i> removal	Space in empty bay for at least one extracted <i>moai</i>		
Petroglyphs	I08, below		
Wider context			
Local outlook: mouth of quarry bay			
Regional outlook: Rano Raraku lake			
Other Comments	The 'nose' is one of several similar features widely spaced in an approximately horizontal line across the rear wall of the quarry bay		

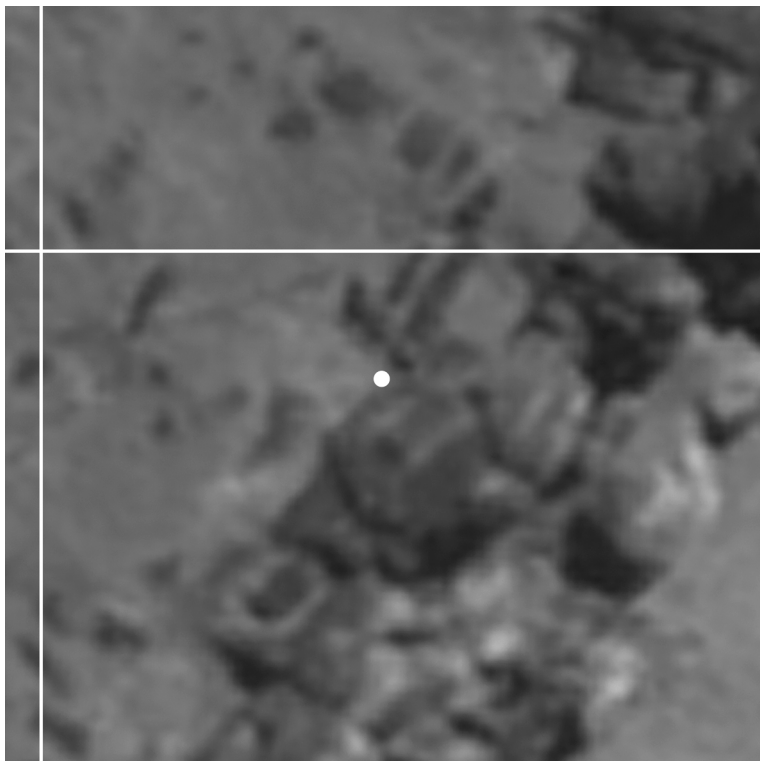
LOC number: I08


Location	
UTM (WGS84) grid reference: 669789/6998677	
Position on volcano: interior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: centre of rear wall of quarry bay	
Vertical position: low	


	
Comments	None

Type/ execution			
Single (right) eye			
Shape: oval/ lenticular			
Slant: none			
Method of carving: incised			
Dimensions: see photo			
Comments: shallowly cut			
Condition/ visibility			
Visibility: faint			
Weathering: moderate	Matrix removal: slight across eye	Lichen: none	Silica reprecipitation: thin and patchy (c. 70%) across eye
Associations			
Associated <i>moai</i>	None		
Evidence of <i>moai</i> removal	Space in empty bay for at least one extracted <i>moai</i>		
Petroglyphs	I07, above		
Wider context			
Local outlook: mouth of quarry bay			
Regional outlook: Rano Raraku lake			
Other Comments	None		

LOC number: I09

Location	
UTM (WGS84) grid reference: 669789/6998687	
Position on volcano: interior quarry	
Nature of surface: vertical quarried wall	
Horizontal position: centre of rear wall of quarry bay	
Vertical position: middle	

	
Comments	Northern and easternmost eye in interior quarry

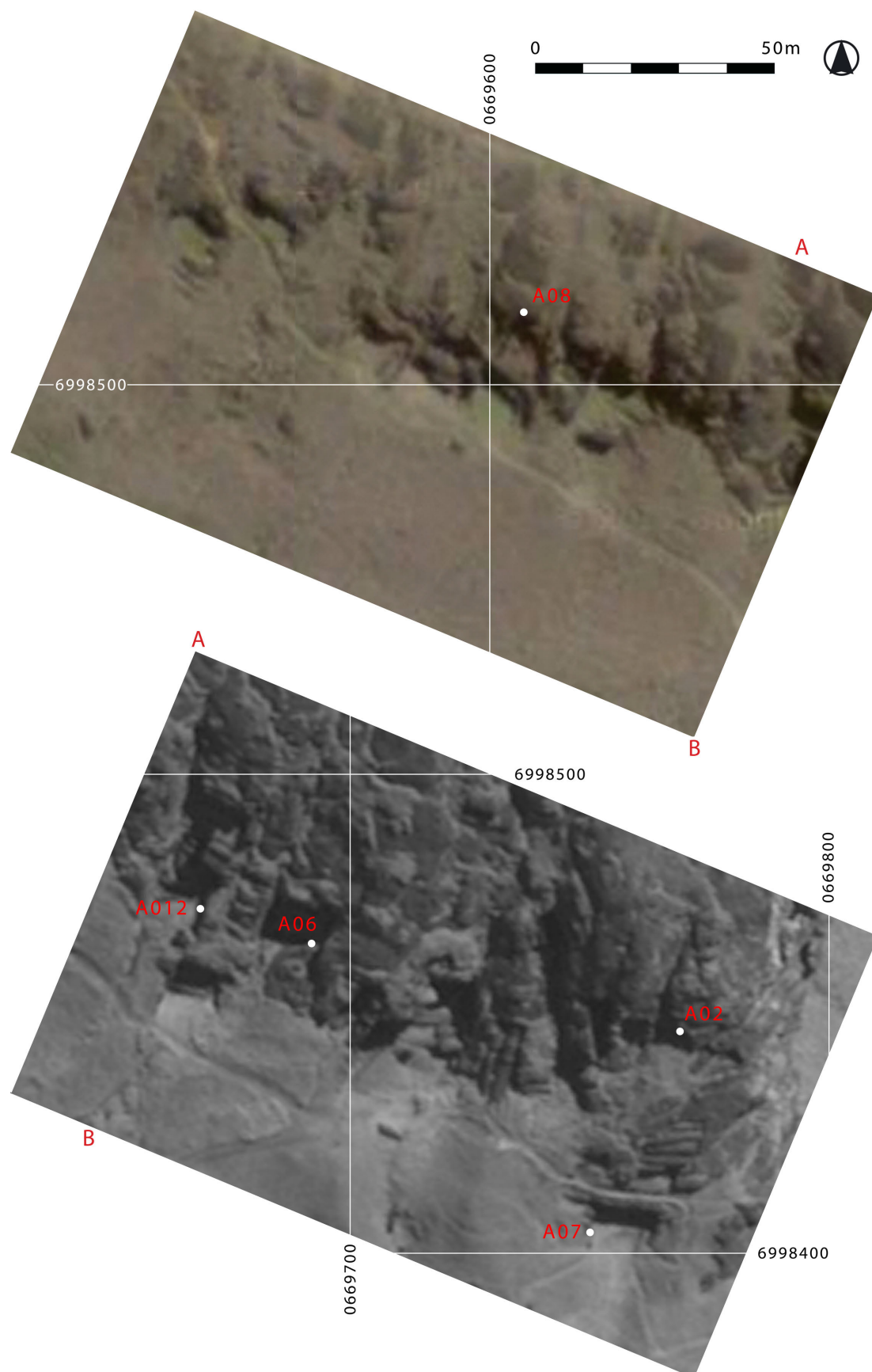
Type/ execution			
Single (left) eye			
Shape: lenticular			
Slant: downward			
Method of carving: incised			
Dimensions: see photo			
Comments: Shallowly cut			
Condition/ visibility			
Visibility:			
Weathering: heavy moderate to severe (edges appear very rounded)	Matrix removal: severe to the top of the eye, moderate to the bottom	Lichen: none	Silica reprecipitation: severe across the top of the eye and then and patchy below (c. 40% total)
Associations			
Associated <i>moai</i>	Two attached supine <i>moai</i> . One, immediately below the eye, lying at right angles to its gaze, and one to the left, also at right angles to I09's gaze		
Evidence of <i>moai</i> removal	Space in bay for one extracted <i>moai</i>		
Petroglyphs	None		
Wider context			
Local outlook: mouth of quarry bay			
Regional outlook: Rano Raraku lake			
Other Comments	None		

Appendix 2. Other petroglyphs identified at Rano Raraku

LOC survey no	Location on volcano/ in quarry		Easting	Northing	Summary description	Dimensions	Execution	Comments/ interpretation
A01	exterior/ lower quarry	on moai head	669407	6998762	see photo	see photo	incised/in positive relief	noted in the field as a 'possible eye' but possibly a double-hulled canoe
A02	exterior	rear wall of quarry bay (in bay to the west of E03)	669772	6998449	pair of globular motifs with curved line above them	see photo	incised	possibly jelly fish
A03	interior	rear wall of quarry bay (just northeast of I06)	669753	6998592	circular 'face' with eyes and lug ears	see photo	incised	Make Make
A04	exterior/ lower quarry	on shoulder of <i>moai</i> 77	669662	6998070	right side of face with eye, nose, cheek mouth and chin	c. 53 (high) by 35 cm (wide)	in positive relief	Make Make
A05	interior	on keel of attached <i>moai</i>	669743	6998590	face	not available	incised	Make Make
A06	exterior	(right) side wall of narrow quarry bay	669685	6998465	circle	c. 45 cm	incised	the moon or a large eye; faces into the mountain, overlooking attached <i>moai</i>
A07	exterior	(left) side wall of quarry bay (left of E02)	669746	6998412	circle	see photo	incised	the moon or an eye; shares the wall with a major complex of petroglyphs
A08	exterior	rear wall of quarry bay	669599	6998520	see photo	see photo	incised	probably a fortuitous arrangement of tool marks

LOC survey no	Location on volcano/ in quarry		Easting	Northing	Summary description	Dimensions	Execution	Comments/ interpretation
A09	interior	on quarry wall below head of attached supine moai	669803	6998640	two horizontally joined ovals	see photo	incised	Make eye mask; very weathered
A10	interior	rear wall of quarry bay (to the left of I03)	669752	6998605	downturned curve	not available	incised	upturned canoe
A11	interior	(right) side wall of quarry bay (to the right of I05)	669787	6998647	rectangle	see photo	incised	adze or foot
A12	exterior	(right) side wall of quarry bay	669665	6998474	<i>moai</i> 'rough out'	see photo	in shallow positive relief	The Heyerdahl team's experimental piece
A13	interior	on moai face	669805	6998682	pear-shaped hollow (long axis approximately parallel to face)	23 x 20 cm	in negative relief	probably fortuitous — perhaps the hole left by the loss of a large inclusion

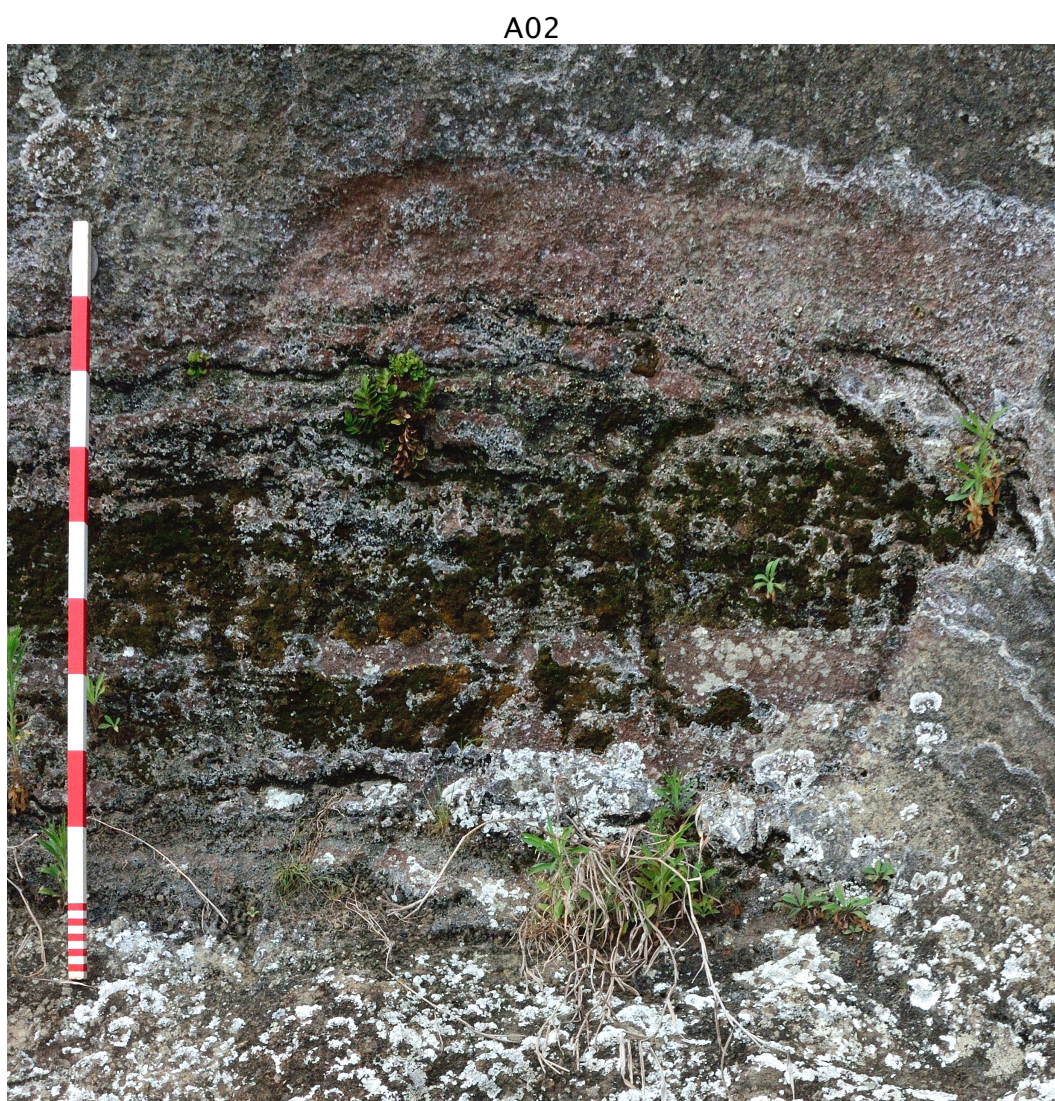
Appendix 3. Location of other petroglyphs identified in the exterior quarry during the survey



Appendix 4. Location of other petroglyphs identified in the interior quarry during the survey



Appendix 5. Photographs of the other petroglyphs identified during the survey





A03



A04



A06

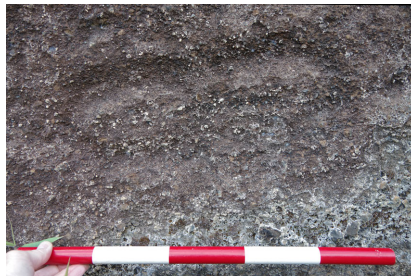
A07



A08



A09



A10



A11





A12



A13

